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**FILARIASIS STUDIES IN MINDANAO ISLAND**

**by**

**Benjamin D. Cabrera, M.D., M.P.H. (T.M.)**

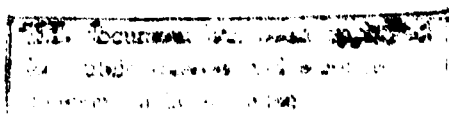
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January 1969

**U. S. ARMY RESEARCH AND DEVELOPMENT GROUP  
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## ABSTRACT

The purpose of this investigation is to determine the endemic areas for malayan filariasis in the island of Mindanao by means of spot or selective surveys. Night blood smears were taken from individuals whose dwellings are located close to fresh water swamps which are ideal breeding places for the vector mosquitoes. Giemsa-stained blood smears were sent by air for examination at the Institute of Hygiene. The most relevant finding in this study is the finding of an endemic focus for Brugia malayi (malayan filariasis) in four municipalities of the province of Agusan. Out of 2,034 persons examined, a total of 25 B. malayi cases (1.2 percent) were found from Agusan. This finding coupled with the presence in the area of fresh water swamps we may safely state that we have found the third endemic focus for malayan filariasis in the Republic of the Philippines. Although we found 4 scattered B. malayi cases from North Davao we are not convinced that the area is endemic for malayan filariasis. It is very possible that infection could have been contracted from Agusan being just adjacent to North Davao. Future investigators should always try to differentiate filariasis caused by W. bancrofti from that caused by B. malayi particularly in Agusan and North Davao. Epidemiological observations in past surveys on W. bancrofti were confirmed, such as: correlation of abaca industry and endemicity of bancroftian filariasis; higher prevalence among males than females; higher in older than in younger age groups.

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## INTRODUCTION

Ever since we reported the existence of filariasis caused by Brugia malayi in the Philippines, it has always been the desire to determine all the endemic foci for this type of filariasis in the entire country. After we found the first endemic focus in the island of Palawan, we have somehow correlated the existence of malayan filariasis in this area to its nearness probably to Borneo which has been previously found endemic for this disease(1, 2, 3). Hence, the next most logical areas for survey would be Sulu archipelago and Mindanao island which are both situated at the southernmost portion of the Philippine archipelago. In our previous work under Contract No. DA-CRD-AG-592-544-66-G60, we were fortunate to discover the second endemic focus for malayan filariasis in the municipality of Bongao of Sulu archipelago(4). Geographically speaking, the only remaining probable endemic focus would be in the island of Mindanao.

Mindanao is the second largest island in the Republic of the Philippines, the first being Luzon. It is as big as Portugal and bigger than Austria. Except for a narrow neck near the north central area, Mindanao would be two islands. The eastern portion is about 380 kilometers east to west and 525 kilometers north to south. The western portion is about 300 kilometers long and 100 kilometers wide. The total land area of Mindanao island is approximately 9,869,000 hectares, unevenly divided among the 15 provinces composed of several towns and cities. The three largest provinces are Cotabato, Davao and Agusan (Fig. 1)(5).

The estimated population of Mindanao is 5,976,000 as of the 1965 Bureau of the Census and Statistics estimate. It appears that some provinces are inhabited by original indigenous tribes as well as immigrants coming from Luzon and the Visayas who number 631,000 and are settled mostly in Cotabato and Davao. As to the original indigenous tribes, most of them belong to the "Muslim" or Mohammedan population of the Philippines with an estimated overall number of 1-1/2 million. The various indigenous tribes are the Tausugs of Zamboanga and Davao, Maranaos of Lanao, Samals of Zamboanga, Sangils of Davao and Cotabato, Guimbahanon or hill people living in the interior of the island and the Maguindanaos living along shores and valleys of Cotabato(6).

The principal industries are logging, mining, cattle raising and fishing. Their important agricultural products are rice, corn, coconuts, abaca (hemp), rubber, sugar cane, fruits, coffee and vegetables. The area is outside the typhoon belt and there is no extreme dry season. The average rainfall is 93 inches per year with a peak of 10.30 inches in December and a low of 5.6 inches during February, March and April. As shown from the climate map (Fig. 2), the major portion of the area falls under the fourth type with a rainfall more or less evenly distributed throughout the year. The entire northeastern area and most of the eastern part are classified under type 2. A relatively small portion in the north central region and the western peninsula is classified as type 3(5, 7).

Of the provinces in Mindanao the province of Agusan has the most number of fresh water swamps. Butuan City which is the capital of the province is located at the mouth of the Agusan river. This river is one of

the three large rivers in the Philippines, with Cagayan river in Luzon being the largest. Agusan valley has about 300 millimeters more rainfall a year than Cagayan Valley in Luzon. There is actually no real dry season, about 325 rainy days are distributed over the whole year. The valley is low and wet and the air is damp all the year round. Mountains surround the valley, from which many streams flow into the main Agusan river (Fig. 3).

The inhabitants of Agusan are mostly Visayans and the minority are Ilocanos. Halfway up the valley is the swamp region. It is covered with trees and plants that grow in water or wet ground. These swamps are caused by the sinking of the bottom of the valley.

The principal objective in the present study is to determine the existence of malayan filariasis in the island of Mindanao, and if present, to determine the extent of the disease. It is not our intention to make an extensive survey of bancroftian filariasis in Mindanao, but rather to limit the work to the search for Brugia malayi endemic area or areas. The presence of a Unit of Filariasis Control Services of the Department of Health in Davao is charged with the survey of filariasis in all provinces of Health Region 8 in Mindanao.

#### MATERIALS AND METHODS

Based on our previous experiences in Palawan and Sulu, which are the first and second endemic foci respectively of malayan filariasis in the Philippines, the survey in Mindanao island is of the selective type according to the presence or absence of swampy areas in the locality. These swampy areas are ideal breeding places for *Mansonia* mosquitoes which have been incriminated as the vectors of malayan filariasis in the Philippines and in Malaysia (2, 8).

##### Blood survey procedures:

The techniques employed in the preparation of blood smears consist of two thick blood films from a finger puncture, approximately 20 mm<sup>2</sup> each smear on a clean, ordinary glass slide per subject. Smears were dried overnight and stained in the morning with dilute Giemsa according to the method of Wilson (9). We employed various methods of obtaining blood from the inhabitants depending upon the place and order situation in the locality. Whenever possible, the inhabitants were requested to assemble in certain designated places not earlier than 1800 hours. However, in places where people were not as cooperative, we employed the house-to-house blood survey with the assistance of a guide and interpreter. Giemsa-stained blood smears were shipped by air to the Department of Parasitology, Institute of Hygiene, and were then examined under a compound microscope at low power magnification. All slides labeled as Brugia malayi in Giemsa stain were destained and immediately stained with Delafield's hematoxylin for verification of species diagnosis. All smears found positive for microfilariae were reviewed and identified by the principal investigator. Microfilarial counts of positive smears were likewise done to determine the density of the parasite in the blood.

In as much as one unit of the Filaria Control Services of the Department of Health is presently stationed in the province of Davao under Health Region 8, we were allowed to review their past data on the filariasis survey they made some years back. Hence there were two filaria surveys made



by two separate groups. One was a highly selective survey made by our team and the other was a previous survey by the Filaria Control Services of the Department of Health stationed at Davao del Norte province under Region 8<sup>(10)</sup>. This Health Region 8 is composed of ten provinces, namely: Agusan, North Davao, Davao Oriental, South Davao, North Surigao, South Surigao, Bukidnon, Misamis Oriental, North Cotabato and South Cotabato. Region 7 on the other hand is composed of 5 provinces in Mindanao, namely: Lanao Norte, Lanao Sur, Misamis Occidental, North Zamboanga and South Zamboanga (Fig. 1).

## RESULTS

Mindanao Island is presently comprised of 15 provinces. Of these, 9 provinces were surveyed covering from one to six municipalities per province. A total of 5,446 persons (2,838 males and 2,608 females) were examined; 135 were found positive (106 W. bancrofti, 25 B. malayi and 4 mixed infection) for filaria or a prevalence rate of 2.48 percent (1.95% W. bancrofti; 0.46% B. malayi and 0.07% mixed infection).

### Distribution and Prevalence:

Table 1 and Figure 4 show the distribution of bancroftian as well as malayan filariasis by sex and municipality among the provinces we have covered. A total of 25 municipalities were sampled from 9 provinces. Eighteen of these municipalities were found positive for either W. bancrofti or B. malayi. B. malayi was found in 6 municipalities - 4 municipalities in the province of Agusan and 2 in the province of Davao del Norte. W. bancrofti was found in 17 of the 18 positive municipalities sampled. The prevalence rates ranged from 0.4 percent to 10.1 percent with 6 or 33.3 percent of the positive municipalities having prevalence rates greater than 5 percent (Bunawan in Agusan; Kapalong in Davao del Norte; Mati and Tarampan in Davao Oriental and Hinatuan and Barobo in Surigao del Sur).

Agusan: Of the 6 municipalities sampled in this province 5 were positive for filariasis. A total of 2,034 (962 males and 1072 females) persons were examined. There were 54 cases found (29 W. bancrofti, 22 B. malayi and 3 mixed infections) or a prevalence rate of 2.6 percent (1.4% W. bancrofti; 1.1% B. malayi and 0.1% mixed infections). B. malayi is present in 4 of the 5 positive municipalities with prevalence rates ranging from 0.3 percent to 2.9 percent. It can be noted that only B. malayi was found in the poblacion of Talacogon.

The municipality of Bunawan ranks first with an overall prevalence of 6.0 percent followed by Lereta (3.5%) and Prosperidad (2.0%). The negative results for Jabonga may be due to the smallness of our sample (Fig. 3).

Bukidnon, Cotabato Norte and Cotabato Sur: A total of 319 persons (153 males and 166 females) were examined covering two municipalities for Bukidnon. A single case of W. bancrofti was found in Don Carlos or a prevalence rate of 0.3 percent. For Cotabato Norte two municipalities were sampled for a total of 117 persons (80 males and 37 females), but all were negative for microfilaria. In Cotabato Sur one town was sampled covering

two barrios. A total of 148 persons (99 males and 49 females) were examined and only one male was positive for W. bancrofti or a prevalence rate of 0.7 percent.

Davao del Norte: A total of 1,319 persons (684 males and 635 females) were examined covering 6 municipalities. Twenty one (17 W. bancrofti, 3 B. malayi and 1 mixed infection) cases were observed or a prevalence rate of 1.6 percent (1.3% W. bancrofti, 0.2% B. malayi and .07% mixed infection). Four of the 6 municipalities sampled were found positive for filaria with Kapalong having the highest prevalence rate (8.7%) followed by Asuncion (1.8%).

It is interesting to note that 4 B. malayi cases, (3 B. malayi and 1 mixed infection) were found in Asuncion, and Monkayo, municipalities of North Davao bordering the southern portion of Agusan province (Fig. 3). Due to the closeness of these municipalities to Agusan and the fact that the cases are adults, we are entertaining the possibility that they could have gotten the infection from Agusan where fresh water swamps abound. The municipality of Taragna ranks first with a prevalence rate of 6.1 percent followed by Mati (5.3%) and Governor Generoso (4.4%). It can be seen that all 3 municipalities have prevalence rates ranking seventh or better among all positive municipalities covered.

Lanao del Sur: A total of 223 persons (177 males and 46 females) were examined covering 4 barrios in the municipality of Tamparan. Not one was found positive for filaria.

Surigao del Norte: Two municipalities were sampled in this province selecting 2 barrios per municipality. A total of 653 persons (324 males and 329 females) were examined. Sixteen were found positive for W. bancrofti or a prevalence rate of 2.4 percent. All four barrios covered were found positive. Tubod has a prevalence rate of 3.8 percent while Mainit has 2.0 percent.

Surigao del Sur: The two municipalities surveyed in this province yielded two of the highest prevalence rates per municipality. A total of 411 persons (205 males and 206 females) were examined. Thirty one were found positive for W. bancrofti or a prevalence rate of 7.5 percent. The municipality of Hinatuan has a prevalence rate of 10.1 percent and Borebo has 6.5 percent. It is to be noted that in two barrios, Roxas in Hinatuan and Javier in Borebo the prevalence rates are greater than 12 percent, a feature equalled only by one other barrio - Calian in Kapalong, Davao del Norte.

Further inspection of Table 1 and Figure 4 show that males consistently have greater prevalence rates in almost all the barrios in all the 18 positive municipalities. For Agusan the prevalence rate among the males is 3.7 percent (2.3% W.b. and 1.4% B.m.) and 2.0 percent for the females (0.9% W.b. and 1.1% B.m.). Bukidnon has a male prevalence rate of 0.6 percent and zero for the females; Cotabato Sur has a male prevalence rate of 1.0 percent and zero for the females; Davao del Norte male prevalence is 2.1 percent compared to 1.1 percent among the females; Davao Oriental male prevalence rate is double that among the females, 5.8 percent and 2.9 percent respectively; Surigao del Norte male prevalence rate is 2.8 percent and 2.1 percent for the females; Surigao del Sur has 7.8 percent for the

males and 7.3 percent for the females.

#### Age and Sex Distribution:

Table 2 and Figure 5 show the age and sex distribution of individuals examined by province. Inspection of the table shows that a great majority of the persons examined are less than 30 years of age. For W. bancrofti, the youngest case is an 8-year old female from Surigao del Sur; the oldest case is an 89-year old male from La Paz, Agusan. For B. malayi the youngest case is a 9-year old male from San Andres, Bunawan, Agusan; the oldest is also from Bunawan - a 68-year old male from barrio Libertad.

One can see that males generally have higher prevalence rates in practically all age groups for the five provinces presented. Furthermore, it can be observed that the prevalence rate generally increases as age advances and are most evident after the age of 20 years. As expected the prevalence rates for age groups 1-15 years are significantly lower compared with the 16 and over age group. This is true in all of the provinces covered, further substantiating the previous observation.

The overall prevalence rate for males is 3.0 percent (2.5% W.b. and 0.5% B.m.) and 1.9 percent for the females (1.4% W.b. and 0.5% B.m.).

The B. malayi cases are relatively younger compared to W. bancrofti cases as observed in Agusan. More than 50 percent of the B. malayi cases are less than 20 years of age in contrast to only 34 percent of the W. bancrofti cases. This may be indicative that B. malayi infection is of recent origin compared to W. bancrofti infection.

#### Relationship Between Prevalence Rate (Both Sexes) and the Ratio of Female over Male Prevalence Rate:

Table 3 and Figure 6 show similar attempt to that made by Cabrera and Cruz<sup>(4)</sup> relating the overall proportion positive to the ratio (R) of % female positive over the % male positive. One can observe that the lower the overall proportion positive in the population the farther away the ratio is from 1 and the higher the overall proportion positive for both sexes the closer the ratio becomes to 1; a finding similar to the observation of the above authors. One can see a positive though not statistically significant relationship.

The municipality of Loroto and Talacogon in Agusan, Mati and Taragona in Davao Oriental and Mainit in Surigao del Norte, deviated from the general trend of observation. On the whole, when the overall proportion positive in the population is greater than 8 percent the proportion of infected females tend to equal those among the males in comparison to the value of 13 percent of the above authors.

#### Filaria Control Services Surveys: Results and Relationship Between Endemicity of Filariasis and Extent of Abaca Plantation:

The Filaria Control Services of the Department of Health has been conducting filaria surveys in the island of Mindanao since 1961. We have tried to correlate the results of their surveys for the period 1961-1968

with the extent of abaca plantation per municipality in percent of available farm area which is presented in Table 4 and Figure 7. One can observe that their survey was more extensive covering the entire island of Mindanao from Agusan to Zamboanga del Sur. Their coverage per province consists of from as low as 32 percent of the total number of municipalities (as of 1960) to complete coverage(10). However their unit reported only bancroftian filariasis and failed to detect the existence of malayan filariasis in this island.

Further examination of the table and figure reveals that all the provinces in the island of Mindanao are endemic for bancroftian filariasis varying in intensity of infection. All municipalities covered in Agusan and Bukidnon are positive; 7 of the 21 municipalities covered in Cotabato Norte being positive; 8 of 12 municipalities covered are positive in Cotabato Sur; all 12 municipalities covered in the 3 provinces of Davao are also positive; 5 of 9 municipalities covered are positive in Lanao del Norte; 1 of 9 municipalities surveyed is positive in Lanao del Sur; 3 of 9 municipalities surveyed are positive in Misamis Occidental; 13 of 15 municipalities surveyed in Surigao del Norte and Surigao del Sur are positive; 7 of 9 municipalities surveyed in Zamboanga del Norte and 6 of 11 municipalities surveyed in Zamboanga del Sur are positive. On the whole 100 of the total of 145 municipalities surveyed were found positive for filariasis.

The intensity of microfilaremia per municipality ranged from 0.1 percent to 7.3 percent. Agusan, Davao Oriental, Davao del Sur, Surigao del Norte and Surigao del Sur are in the group with microfilaremia rates of 2 percent or more. Bukidnon and Misamis Oriental from 1.0 percent to less than 2 percent and the rest having microfilaremia rates less than 1 percent. North Cotabato, Lanao del Norte and del Sur, Misamis Occidental and Zamboanga del Sur are the provinces having the least microfilaremia rate (0.1% - 0.3%) (Fig. 8).

Further inspection of Table 4 reveals that in 100 municipalities found positive for filaria, abaca is present in 72, 12 are newly created towns where no abaca data is available and in 6 abaca is absent. Correlation analysis between microfilaremia rate and extent of abaca plantation for each province revealed the following results:

<u>Province</u>	<u>Correlation coefficient</u>
Agusan	0.8838 (significant, $P < .01$ )
Bukidnon	0.6386 (significant, $P < .05$ )
Cotabato Norte & Sur	0.8499 (significant, $P < .01$ )
Davao Norte, Sur & Oriental	-0.4062 (not significant, $P > .05$ )
Lanao del Norte	-0.3287 (not significant, $P > .05$ )
Lanao del Sur	0.0446 (not significant, $P > .05$ )
Misamis Occidental	-0.2388 (not significant, $P > .05$ )
Misamis Oriental	0.1701 (not significant, $P > .05$ )
Surigao del Norte	-0.0940 (not significant, $P > .05$ )
Surigao del Sur	0.5069 (not significant, $P > .05$ )
Zamboanga del Norte	0.6869 (not significant, $P > .05$ )
Zamboanga del Sur	-0.2024 (not significant, $P > .05$ )
Overall	0.3484 (significant, $P < .01$ )

One notices that the first 3 provinces show significant positive results, 5 have negative though not significant results. However the overall relationship is highly significant and is positive, indicating higher microfilaremia rates in areas with wider abaca plantation. This can be seen in Figure 7 where we plotted the average microfilaremia rate and percent of available farm area planted with abaca per province.

Table 5 shows the results of our survey in comparison to those of the Filaria Control Services by province. The microfilaremia rate in our surveys is higher in 4 provinces (results were combined for the 3 Davaos and 2 Cotabatos) and lower in 3 provinces. This can be explained by deliberate selection of areas where malayan filariasis can be most likely found in our surveys, coupled of course with smaller sample sizes.

#### Microfilarial Density:

Table 6 shows the average microfilarial density of cases by age and sex for each province. In Agusan, the highest average W. bancrofti microfilarial count per positive is 51.0 in the age group 16-20 years among males and 4.0 in the age groups 21-25 and 31-35 among females. For both sexes combined the highest is found in age group 16-20 with an average microfilarial density of 38.5 per positive. For the malayan type the highest is found in the age group 41-45 among males (31.0 per positive) and in 11-15 age group among the females (3.2 per positive). For both sexes combined the highest count is in the age group 41-45 (11.7 per positive). For all ages combined the average microfilarial count per positive for males are 12.2 per positive (W.b.) and 5.2 per positive (B.m.). For females they are 2.3 per positive (W.b.) and 2.2 per positive (B.m.) and for both sexes combined 9.1 per positive (W.b.) and 3.8 per positive (B.m.).

Davao del Norte: Among the males the highest is found in the age group 21-25 (44.8 per positive) for W. bancrofti and the single male case of mixed infection aged 21 years has a B. malayi microfilaria count of 15. Among the females the highest is found in the age group 11-15 (17.0 per positive) for W. bancrofti and the 3 female B. malayi cases aged 15, 17, and 26 years had a microfilarial count of 1, 2, and 3 respectively. For both sexes combined the age group 21-25 has the highest (27.3 per positive) for W. bancrofti. For all ages the average per positive among the males is 16.5 (W.b.), females is 7.2 (W.b.) and both sexes 14.4 (W.b.) and 5.2 (B.m.).

Davao Oriental: All the cases found in this province are bancroftian filariasis. Among the males the highest microfilarial count is found in the age group 21-25 (37.0 per positive) and for the females in the age group 16-20 (9.5 per positive). For both sexes combined the highest found is in the age group 21-25 (37.0). For all ages males have 15.8 per positive, females 9.5 per positive and both sexes 14.6 per positive.

Surigao del Norte: All the cases found in this province are bancroftian filariasis. The highest microfilarial count per positive are found in the same group for both males and females and both sexes - 26-30 years with 41.7 for the males and 46.0 for the females and 42.8 for both sexes. For all ages it is 32.9 among the males, 12.0 for the females and 23.8 for both sexes.

Surigao del Sur: All the cases found in this province are also bancroftian filariasis. Among the males the highest average microfilarial count is found in the age group 16-20 (100.0 per positive) and for the females it is found in the age group 51-55 (62.0 per positive). For both sexes, it is in the age group 16-20 (100.0 per positive). For all ages, among the males it is 30.0 per positive, among females it is 10.7 per positive and for both sexes it is 20.6 per positive.

The male cases of W. bancrofti found in Bukidnon and Cotabato Sur have microfilarial counts 12 and 9, ages 21 and 38 years respectively.

Table 7 shows the distribution of cases by sex and intensity of microfilaremia for each province positive for filariasis. The median and highest microfilarial counts are likewise presented for each sex. For both bancroftian and malayan filariasis and in all the provinces the highest microfilarial count is always among the males. The highest microfilarial count among males in the provinces of Agusan, Davao del Norte and Surigao del Sur are above 100 for W. bancrofti - 123, 134 and 135, respectively. The highest microfilarial count among females is 62 (W.b.) found in the province of Surigao del Sur.

For the median microfilarial count the highest is found among males in Surigao del Norte 27.0 (W.b.) followed by Surigao del Sur 14.0 (W.b.) and Agusan 5.5 (W.b.). Among females the highest is in Surigao del Norte likewise 10.0 (W.b.) followed by Davao del Norte 5.0 (W.b.), and Surigao del Sur 3.0 (W.b.).

It can be observed that females in the provinces of Davao del Norte and Davao Oriental have higher median microfilarial counts than the males. All other provinces showed higher median microfilarial counts among males compared to females. For B. malayi the median microfilarial counts are equal.

For both sexes, Surigao del Norte topped the five provinces with a median microfilarial count of 17.0 (W.b.) followed by Surigao del Sur 8.0 (W.b.), Davao Oriental 5.0 (W.b.), Davao del Norte 4.5 (W.b.) and Agusan 2.5 (W.b.). For B. malayi the median microfilarial count for Agusan is 2.0.

The overall results show the median microfilarial count among the males to be 8.9 (W.b.) and 4.5 (B.m.) and for the females 4.8 (W.b.) and 3.7 (B.m.). For both sexes the values are 6.3 (W.b.) and 4.0 (B.m.).

#### Further Analysis of Microfilarial Counts:

Microfilarial counts of individual cases if obtained under more or less uniform conditions are valuable in the comparison of intensity of infection among populations in different endemic areas, or for evaluating the effects of control measures applied to a population. Several approaches have been made by different researchers using some well known statistical techniques. It has eventually been shown through several studies that the frequency distribution of microfilarial density is essentially logarithmically normal. This implies that the logarithmic transformation of microfilarial density converts the distribution from

asymmetric to a normal one. Sasa et al. (1964) was the first to recognize this(14).

The analysis of this type of data has been clearly described in the paper of Cabrera and Cruz (1968). The procedure followed below utilized mathematical methods generally applicable for obtaining the most reasonable estimates of the values of the constants in the simple regression line:  $y = a + b \log x$ , where  $y$  is the probit of cumulative frequency of density  $x$  microfilariae,  $a$  is the percentage of cases with microfilarial count 1 (or zero in logarithm), and  $b$  is the regression coefficient that determines the angle of the line from the  $x$ -axis. The fifty percent level of microfilarial density (MfD50 = median microfilarial count) is obtained by solving the equation:  $\log x = (5-a)/b$ , or by reading the value of  $x$  at the point where the regression line crosses probit 5 (50 percent in the cumulative frequency) level. The standard deviation ( $s$ ) corresponds to the distance on the horizontal axis of the points at which the regression line crosses probit 5 (50 percent) and probit 6 (84.1 percent).

Table 8 presents distribution of cases by intensity of microfilaremia. Cumulative frequencies and relative cumulative frequencies in percent are included for purposes of plotting the probit regression line.

Table 9 shows the median microfilarial count and the proportion of cases with microfilarial counts of 1 per 20 mm<sup>3</sup> blood by province as obtained from the regression analysis of the frequency distribution of microfilarial density. The median microfilarial count (MfD50) and percent of cases with microfilarial count 1 column simply mean that, by and large, one will expect fifty percent of cases in the specified area to have microfilarial count equal to or less than the MfD50 and the specified percentage of cases to have microfilarial count of 1. One can see that males generally have greater MfD50 and lesser proportion of cases with microfilarial count of 1. Furthermore, it can be seen that Surigao del Norte topped the 5 provinces followed by Surigao del Sur and Davao Oriental with MfD50 of 11, 7 and 6 compared to 27, 8, and 5, respectively as obtained previously (Table 7). Figure 9 clearly shows this observation.

One can observe that there is a tendency for the proportion of cases with microfilarial count of 1 to become smaller as the prevalence rates increase, and also the tendency of the value of  $a$  of the regression equation to decrease as the prevalence rate increases.

#### Comparison of B. malayi Average Microfilarial Counts per 20 mm<sup>3</sup> Blood of Subjects from Palawan, Sulu and Agusan:

Comparison of microfilarial counts among B. malayi cases in Palawan and Sulu has been done by Cabrera et al. (1968) to find out if malayan filariasis was introduced at the same time in those two areas. Table 10 is presented to further study the same problem by extending the comparison to the province of Agusan. The highest average microfilarial count for Palawan is in the age group 51-55 (57.5 per positive), while in Sulu the highest is found in the age group 21-25 (14.5 per positive). In Agusan the highest average microfilarial count is in the age group 41-45 (11.7 per positive). For all ages the average counts per positive are 26.6 for Palawan, 5.2 for Sulu and 3.8 for Agusan. One must be cautious in interpreting the above averages as they are generally inflated by the presence

of unusually high microfilarial counts.

To minimize the influence of the extremely high microfilarial counts the above authors utilized the median in their comparison. Extending the comparison to Agusan one observes that the province has the lowest value, following the trend in age by age comparison of the average microfilarial counts per positive. The 4 B. malayi cases found in Davao del Norte has a median of 2.5 per positive and a range of microfilarial count from 1-15. The ages of the cases are 15, 17, 21 and 26 years. It appears that these cases are recent infections relatively speaking.

#### DISCUSSION

Surveys conducted from 1959 to the present by the Filaria Control Services of the Department of Health indicate the existence of filariasis in all provinces in Mindanao. As far as we know, no report has been made on the existence of Brugia malayi in the island of Mindanao. The extent of the problem varies in intensity from moderately high microfilaremia rate in the eastern portion which includes the province of Agusan, 2 Surigaos and 3 Davaos, and low microfilaremia rate going towards the western portion. Incidentally the same distribution is true for the extent of abaca plantation 5.8 percent in the eastern portion and only 1.6 percent in the western portion (Fig. 10). This confirms the significant correlation obtained between microfilaremia rates and extent of abaca plantation in percent of available farm area.

The most significant finding in our survey is the discovery of the existence of Brugia malayi in the towns of Bunawan, Loreto, Prosperidad and Talacogon in Agusan and Asuncion and Monkayo in Davao del Norte. A total of 25 cases (13 males and 12 females) were found in Agusan or a prevalence rate of 1.2 percent. For Davao del Norte 4 cases (1 male and 3 females) were seen or a prevalence rate of 0.3 percent. Four of these 29 cases (all males) were mixed infections- 3 found in barrio Libertad, Bunawan, Agusan and 1 in Laac, Asuncion, Davao del Norte. The prevalence rates for each barrio ranged from 0.5 percent to 5.1 percent. It is significant to note that the environmental conditions in Bunawan, Prosperidad and Talacogon in Agusan are similar to those in Quezon, Palawan (1966) which is the first endemic focus for malayan filariasis in this country. Because of the paucity of cases found, the absence of probable breeding areas such as fresh water swamps in Davao Norte, and the accessibility and nearness to Agusan, we are inclined to believe that infection could have been acquired from Agusan where the disease is apparently endemic.

We attempted to find out if malayan filariasis was introduced at about the same time in Palawan (1964), Sulu (1968) and Agusan. Table 10 seems to indicate that those of Sulu and Agusan were introduced at about the same time as evidenced by about the same microfilaremia rates 0.78 percent and 1.2 percent in comparison to 4.9 percent of Palawan and the median microfilarial density of 3 and 2 per 20 mm<sup>3</sup> in contrast to 6 in Palawan.

Our observation in Palawan and Jolo where there is a preponderance of males over females and an increase in microfilaremia rates principally in



ages 20 years and over is likewise true as revealed by our results - 29 percent of the cases belong to age groups less than 20 years, 71 percent above 20 years of age. The microfilaremia rates among females tend to equal those among males when the microfilaremia rates for both sexes is about 8 percent in comparison to about 13 percent as reported by Cabrera et al. (1968) (11, 12, 4).

It has been observed by Sasa (1967) that where filariasis is highly prevalent and microfilarial density of the population is high, the values of a and b of the regression equation are usually small and are considered good indications of endemicity (13). Our results in Table 9 and Figure 8 however only show a slight indication of this observation.

Further observation of Table 9 shows that on the average one can expect about 15 percent of bancroftian cases to have a microfilarial density of 1 per 20 mm<sup>3</sup> blood in comparison to about 41 percent for malayan cases. One generally expects among male cases, greater microfilaremia density for both bancroftian and malayan filariasis in comparison to the females which maybe due to more exposure secondary to the factor of occupation.

#### SUMMARY AND CONCLUSION

A total of 5,446 persons covering 9 provinces of Mindanao were examined and 106 (1.95%) were found positive for W. bancrofti; 25 (0.46%) for B. malayi and 4 (0.07%) mixed infection. It appears that the province of Agusan is endemic for malayan filariasis which becomes the third focus for Brugia malayi in the Republic of the Philippines. The correlation between abaca industry and the endemicity of bancroftian filariasis is clearly shown in this study. The disease is endemic in areas where abaca is found.

As in our previous findings in Palawan and Sulu, the prevalence is higher in males than females and higher likewise in older than in younger age groups.

When the overall proportion positive in the population becomes greater there is tendency for the proportion of infected females to equal those infected males. This maybe a good index in determining the degree of endemicity of the disease in a given community.

Based on the average microfilarial count in relation to the age composition of subjects, we arrived at the conclusion that probably malayan filariasis was introduced earlier in Palawan than introduced in Sulu and Agusan at about the same time at a much later date.

#### ACKNOWLEDGMENT

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Fig. 1. PROVINCES OF MINDANAO ISLAND

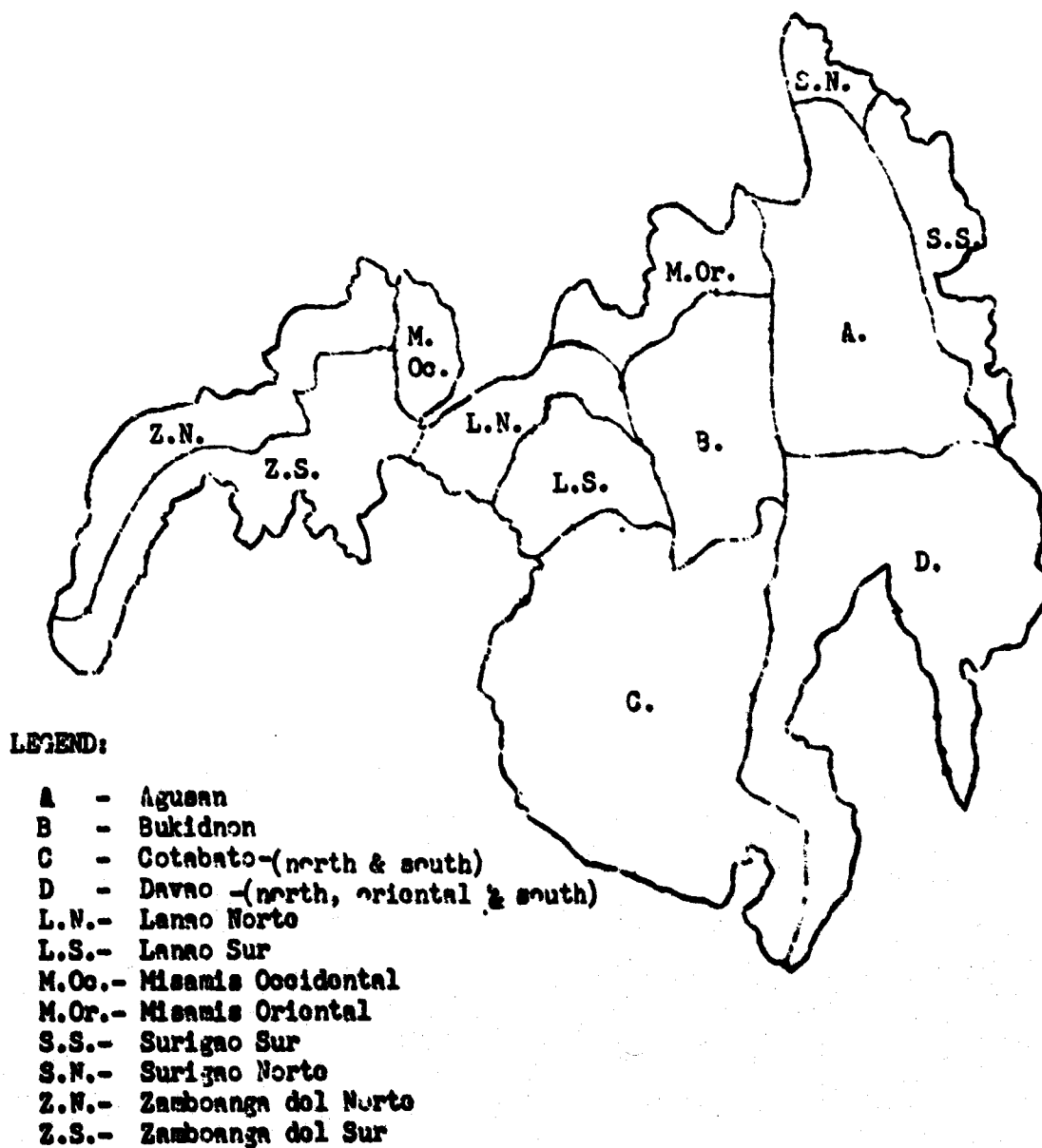
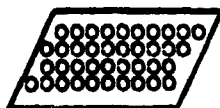


Fig. 2. CLIMATE MAP OF MINDANAO

LEGEND:



1st Type - Two pronounced seasons: dry from November to April; wet during the rest of the year.



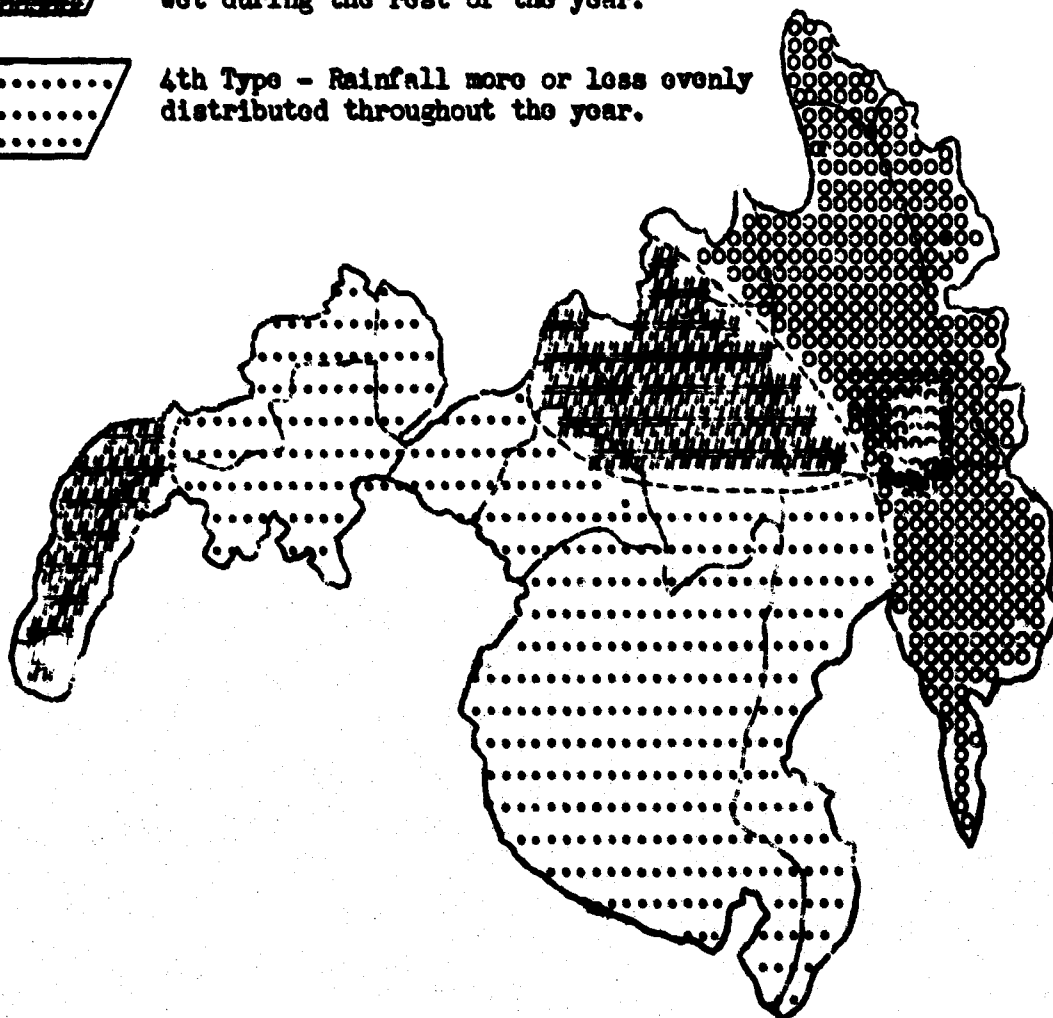
2nd Type - No dry season with a very pronounced maximum rainfall from November to January.






3rd Type - Seasons not very pronounced, relatively dry from November to April and wet during the rest of the year.










4th Type - Rainfall more or less evenly distributed throughout the year.

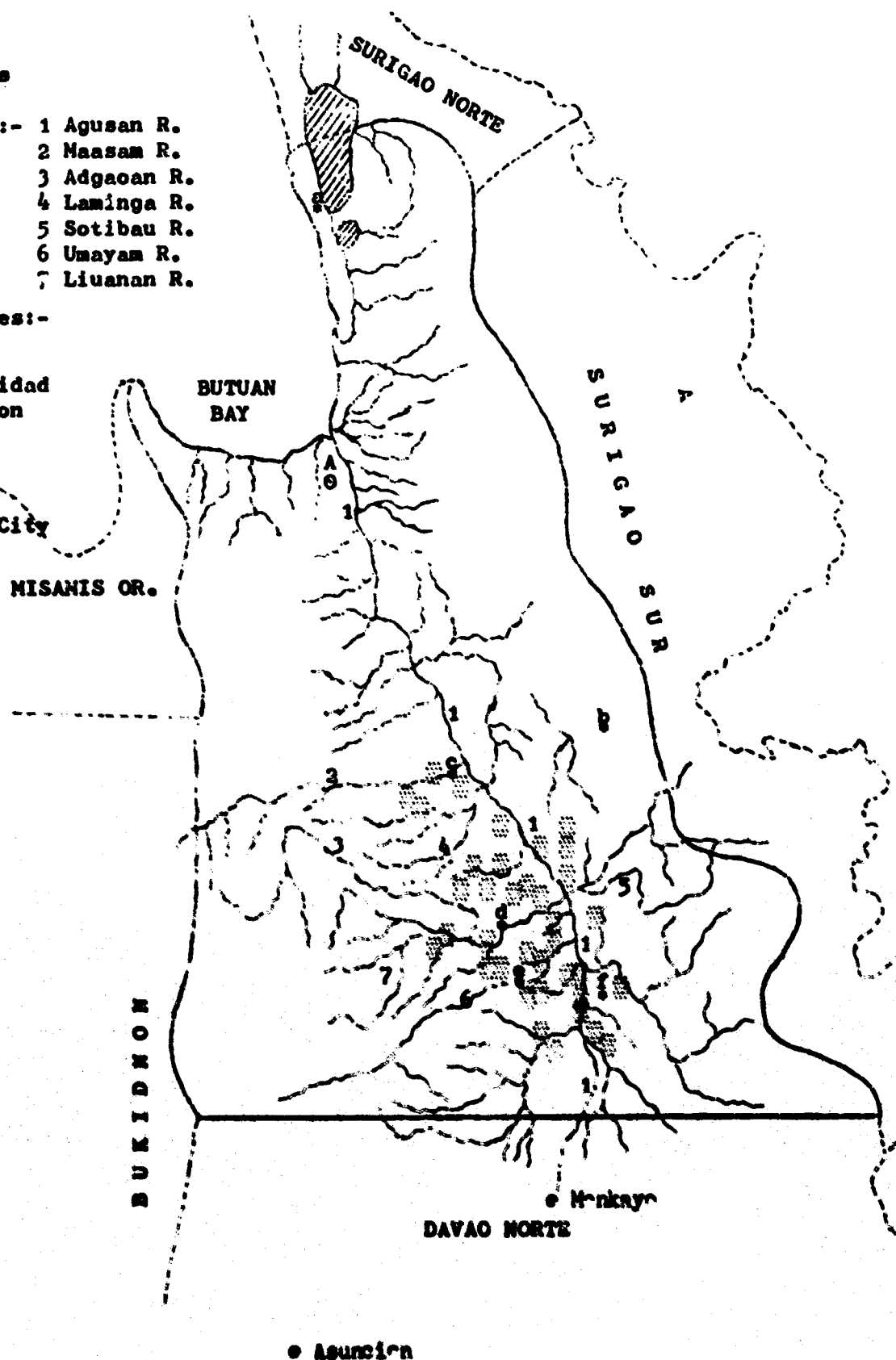


**Legend:**

-  - Swamps
  -  - Lake
  -  - River:-
- 1 Agusan R.
  - 2 Maasan R.
  - 3 Adgaoan R.
  - 4 Laminga R.
  - 5 Sotibau R.
  - 6 Umayam R.
  - 7 Liuanan R.

**Municipalities:-**

-  - Jabonga
-  - Prosperidad
-  - Talacogon
-  - La Paz
-  - Loreto
-  - Bunawan
-  - Butuan City



**Fig. 3. MAP OF AGUSAN PROVINCE, MINDANAO**

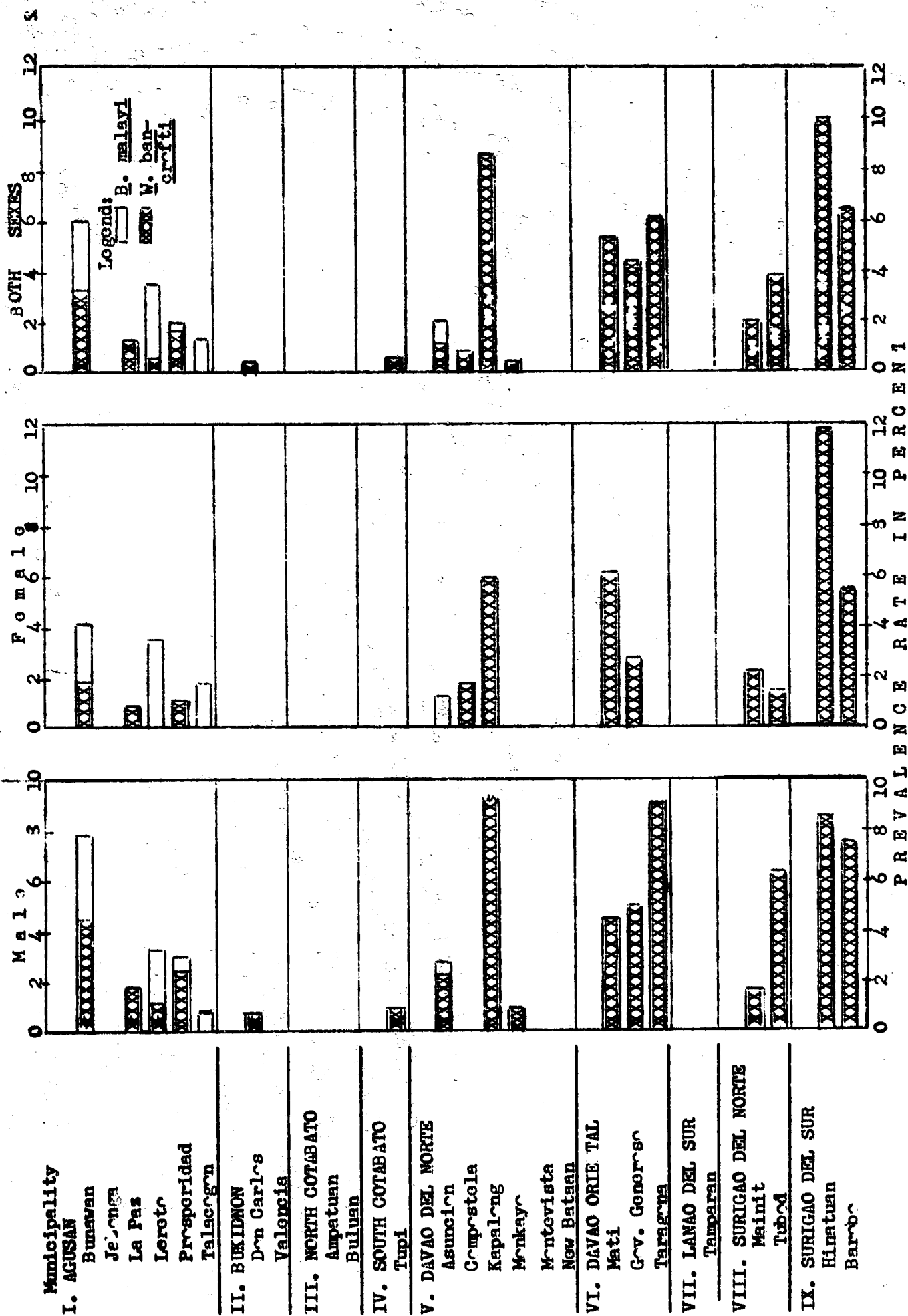


Fig. 4. FILARIA PREVALENCE RATE BY MUNICIPALITY, MINDANAO, 1968.

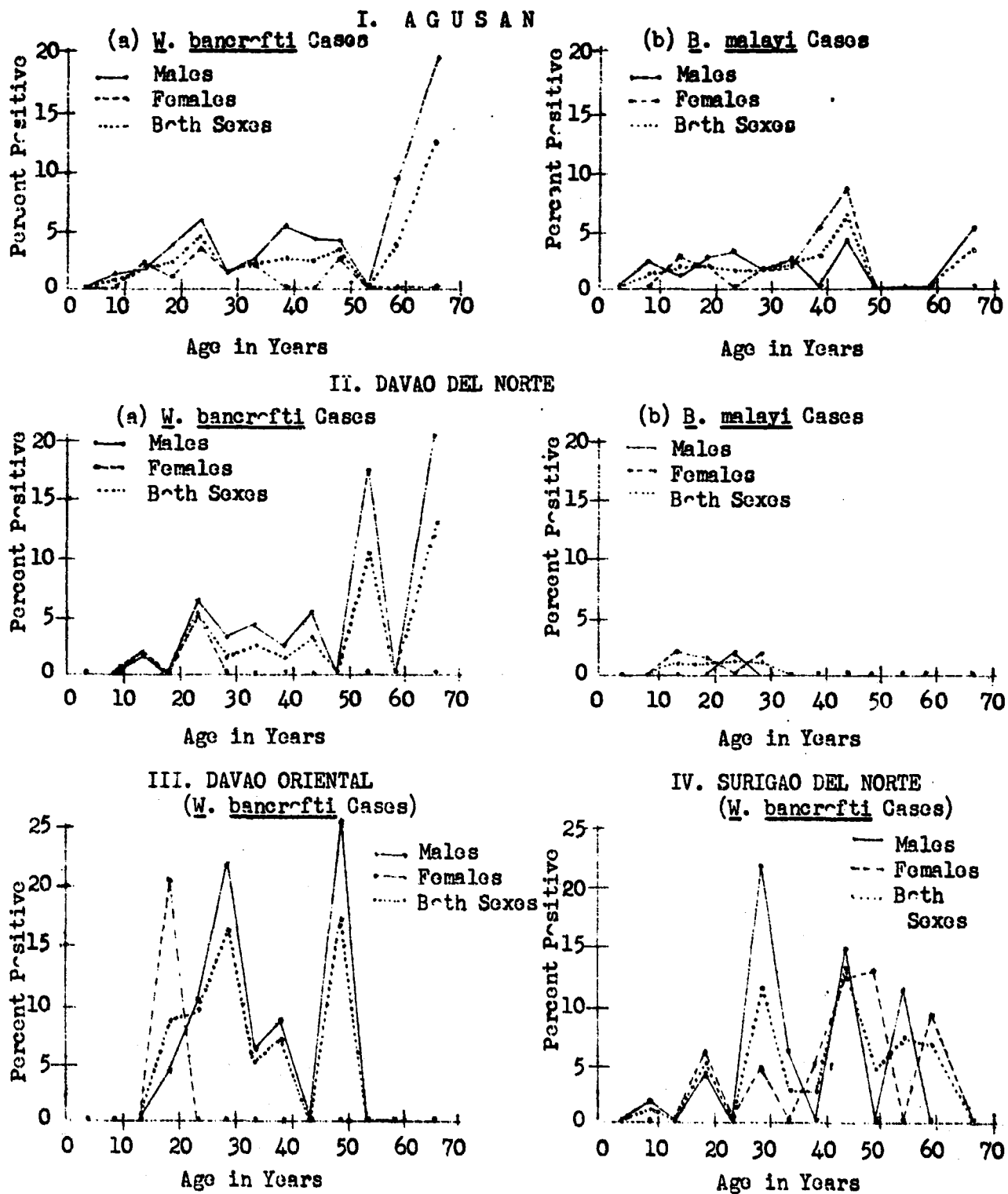
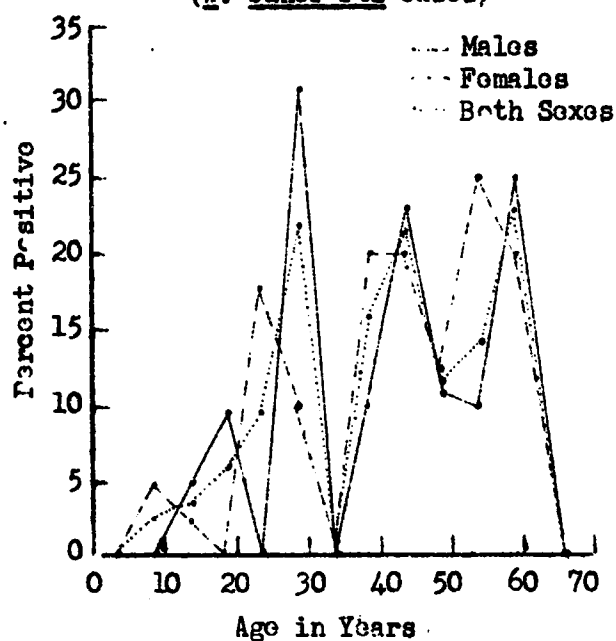


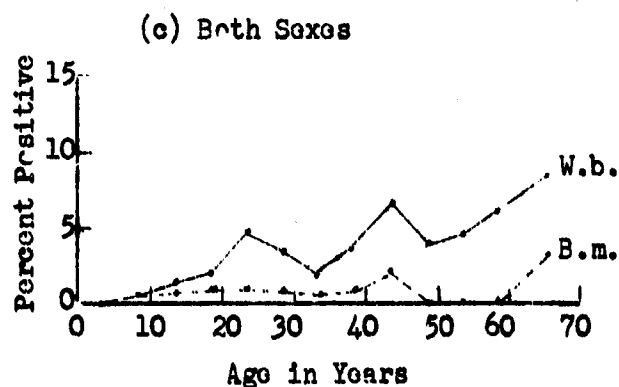
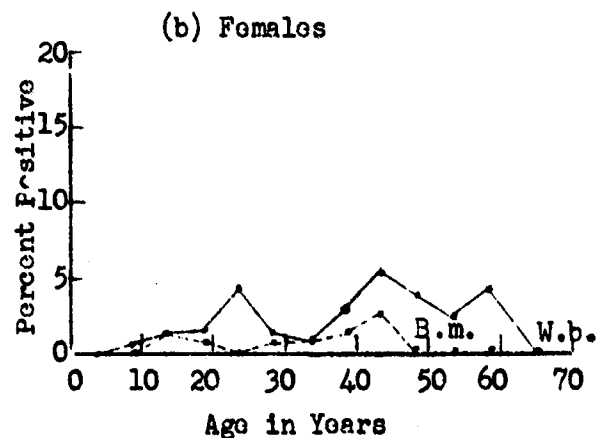
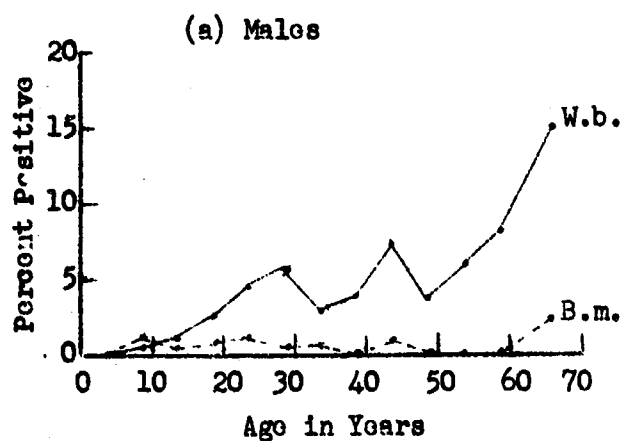
Fig. 5. FILARIA PREVALENCE RATES BY AGE AND SEX, MINDANAO, 1968.



V. SURIGAO DEL SUR  
(*W. bancrofti* Cases)



VI. ALL PROVINCES



(Fig. 5- Cont'd) FILARIA PREVALENCE RATES BY AGE AND SEX, MINDANAO, 1968.

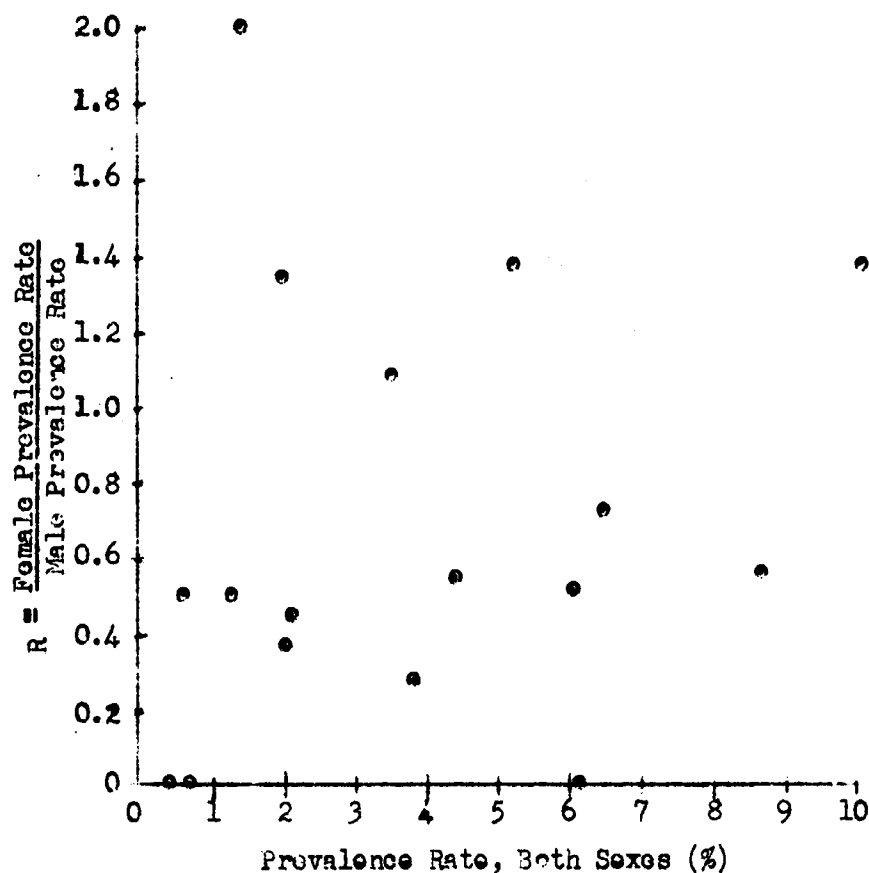


Fig. 6. RELATIONSHIP BETWEEN PREVALENCE RATE (BOTH SEXES) AND  
R = FEMALE PREVALENCE RATE/MALE PREVALENCE RATE.

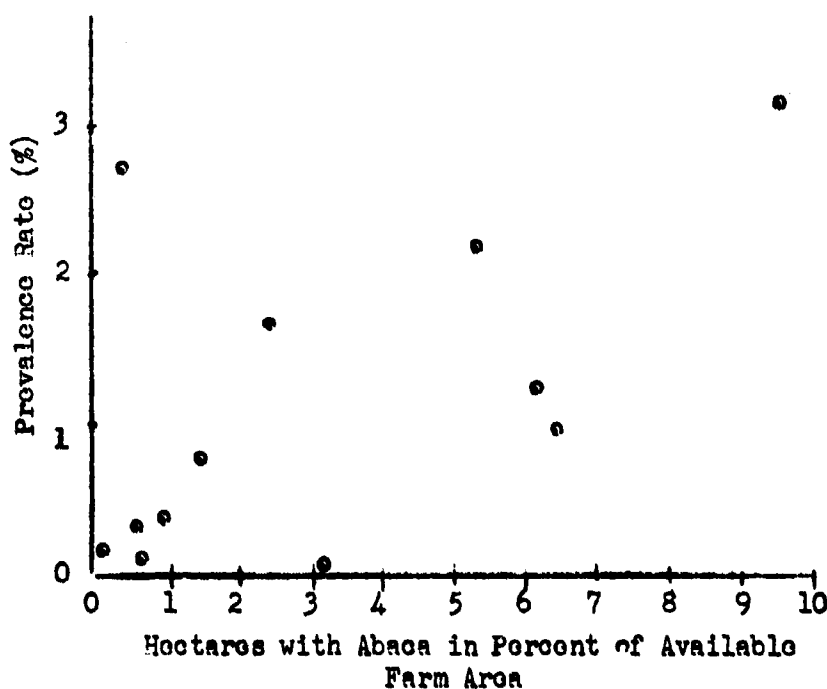
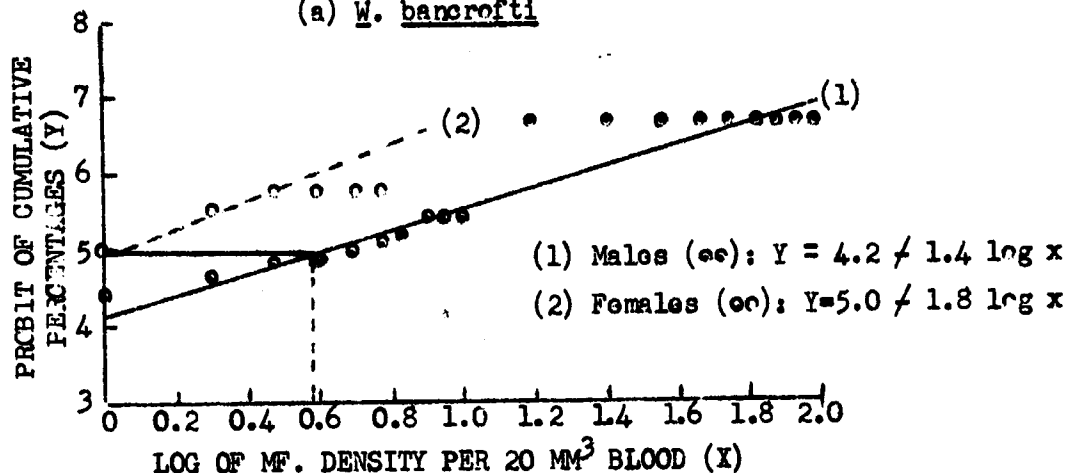


Fig. 7. RELATIONSHIP BETWEEN FILARIA PREVALENCE RATE  
AND EXTENT OF ABACA PLANTATION IN PERCENT  
OF AVAILABLE FARM AREA, MINDANAO.

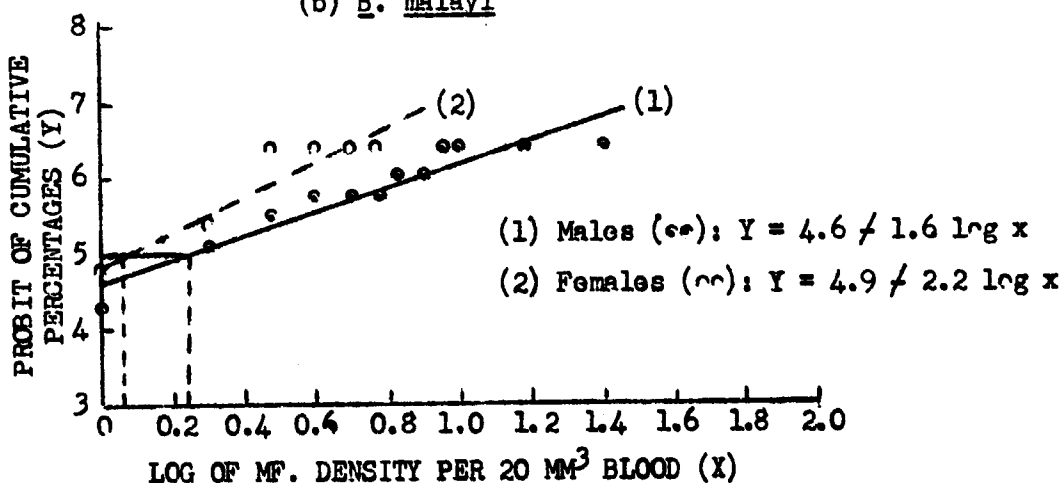
(Data obtained from the Filaria Control Services surveys, Dept. of Health, 1961-1968 and the Agricultural Census of the Bureau of the Census and Statistics)

# I. AGUSAN

## (a) W. bancrofti



## (b) B. malayi



# II. DAVAO DEL NORTE

## (a) W. bancrofti \*

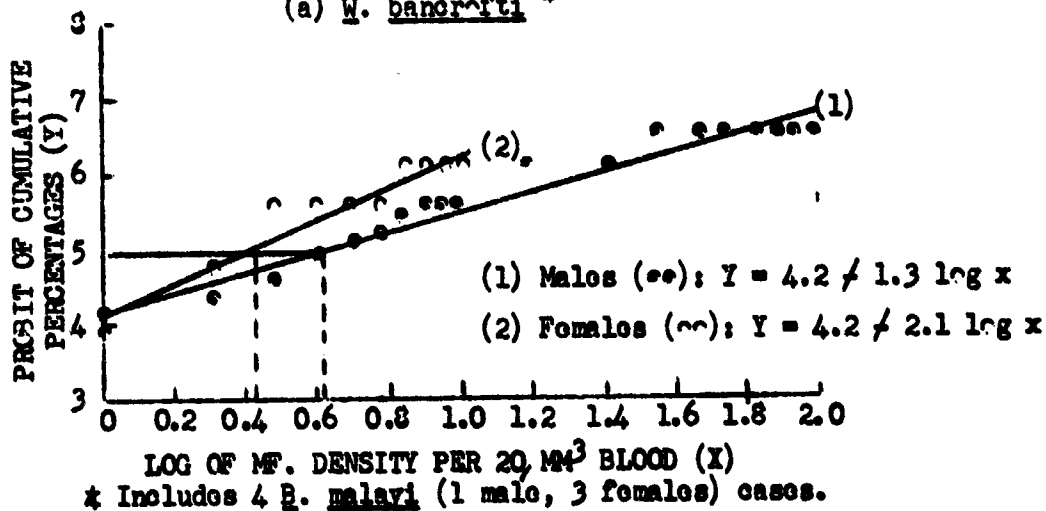
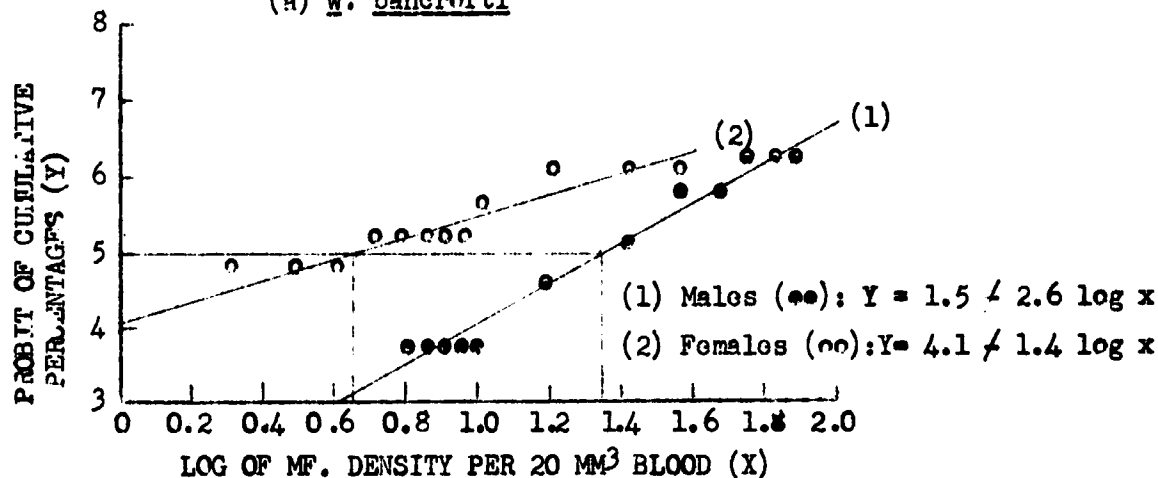


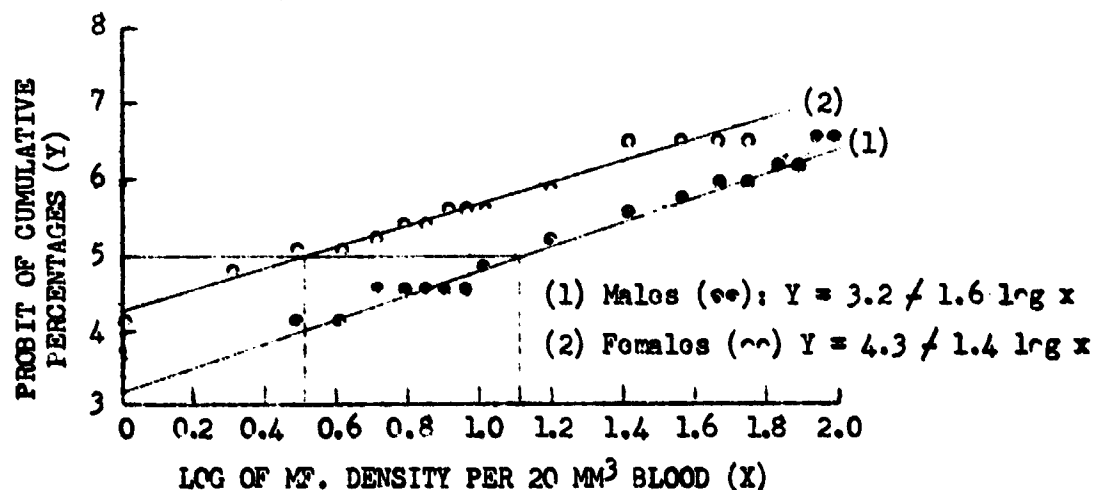
Fig. 8. LOG-PROBIT REGRESSION LINES OF CUMULATIVE PERCENTAGE DISTRIBUTIONS OF MICROFILARIAL DENSITY FOR FOUR PROVINCES OF MINDANAO, BY SEX, 1968.

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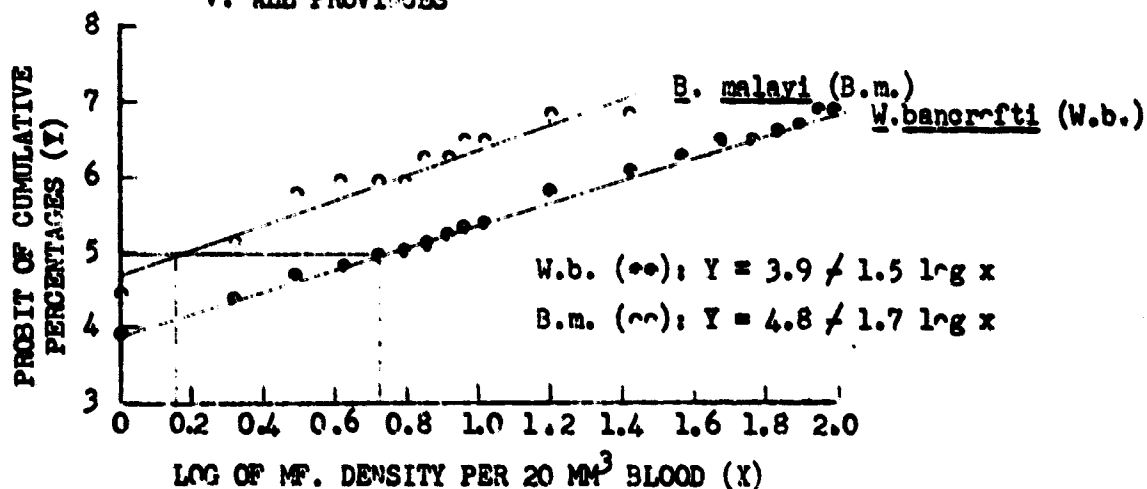
(Fig. 8. Cont'd) III. SURIGAO DEL NORTE  
(a) W. bancrofti



IV. SURIGAO DEL SUR  
(a) W. bancrofti



V. ALL PROVINCES



(Fig. 8. Cont'd) LOG-PROBIT REGRESSION LINES OF CUMULATIVE PERCENTAGE DISTRIBUTIONS OF MICROFILARIAL DENSITY FOR FOUR PROVINCES OF MINDANAO, BY SEX, 1968.

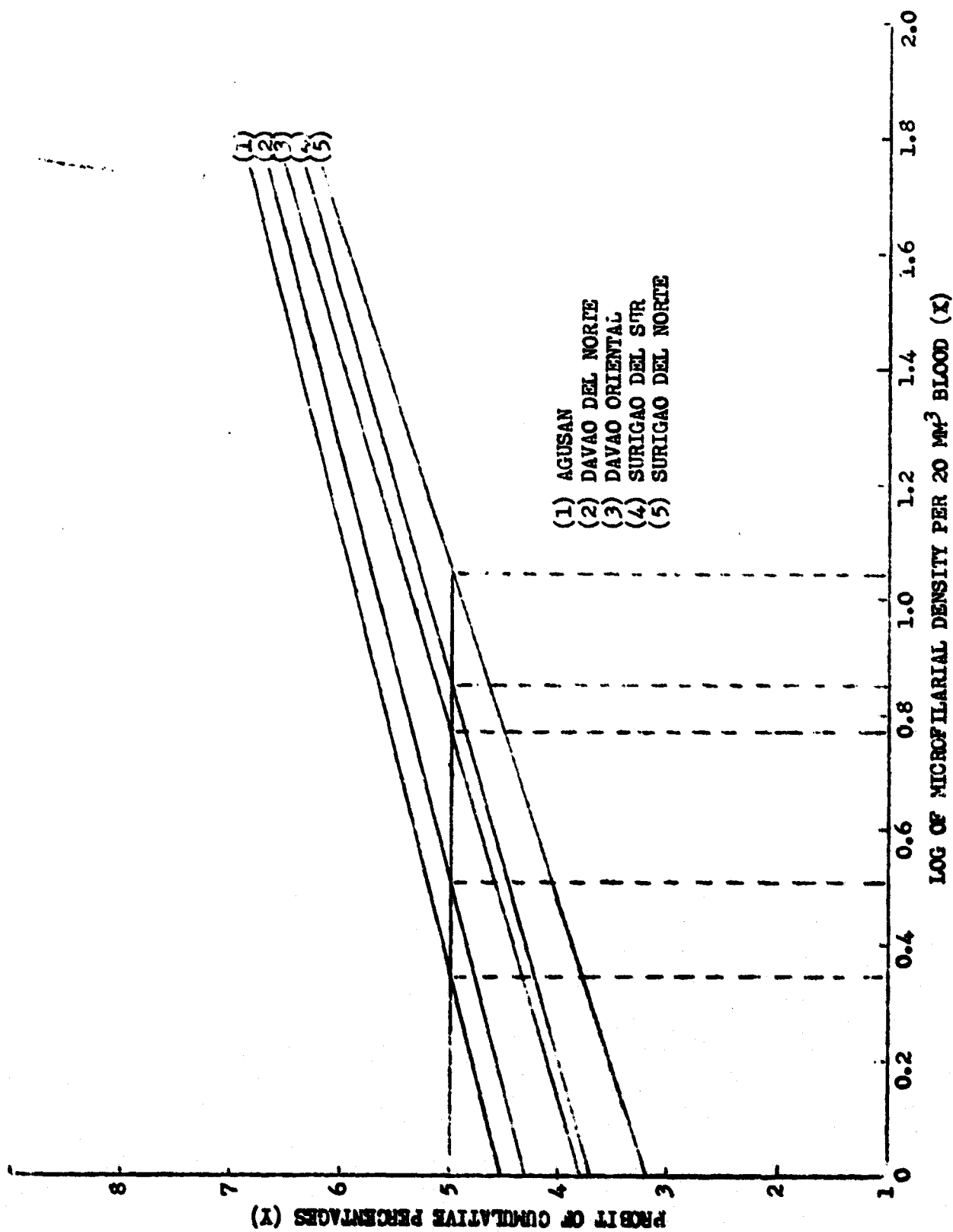


Fig. 9. LOG-PROBIT REGRESSION LINES OF CUMULATIVE PERCENTAGE DISTRIBUTIONS OF MICROFILARIAL DENSITY ( $\bar{M}$ . bancrofti) FOR FIVE PROVINCES, MINDANAO, 1968

Fig.10. FILARIA PREVALENCE RATES<sup>/1</sup> AND EXTENT OF  
ABACA PLANTATION<sup>/2</sup> IN THE PROVINCES OF  
MINDANAO ISLAND.

<sup>/1</sup> - Filaria Control Services Surveys, 1961-1968.

<sup>/2</sup> - Bureau of the Census and Statistics  
Agriculture Census, 1960.

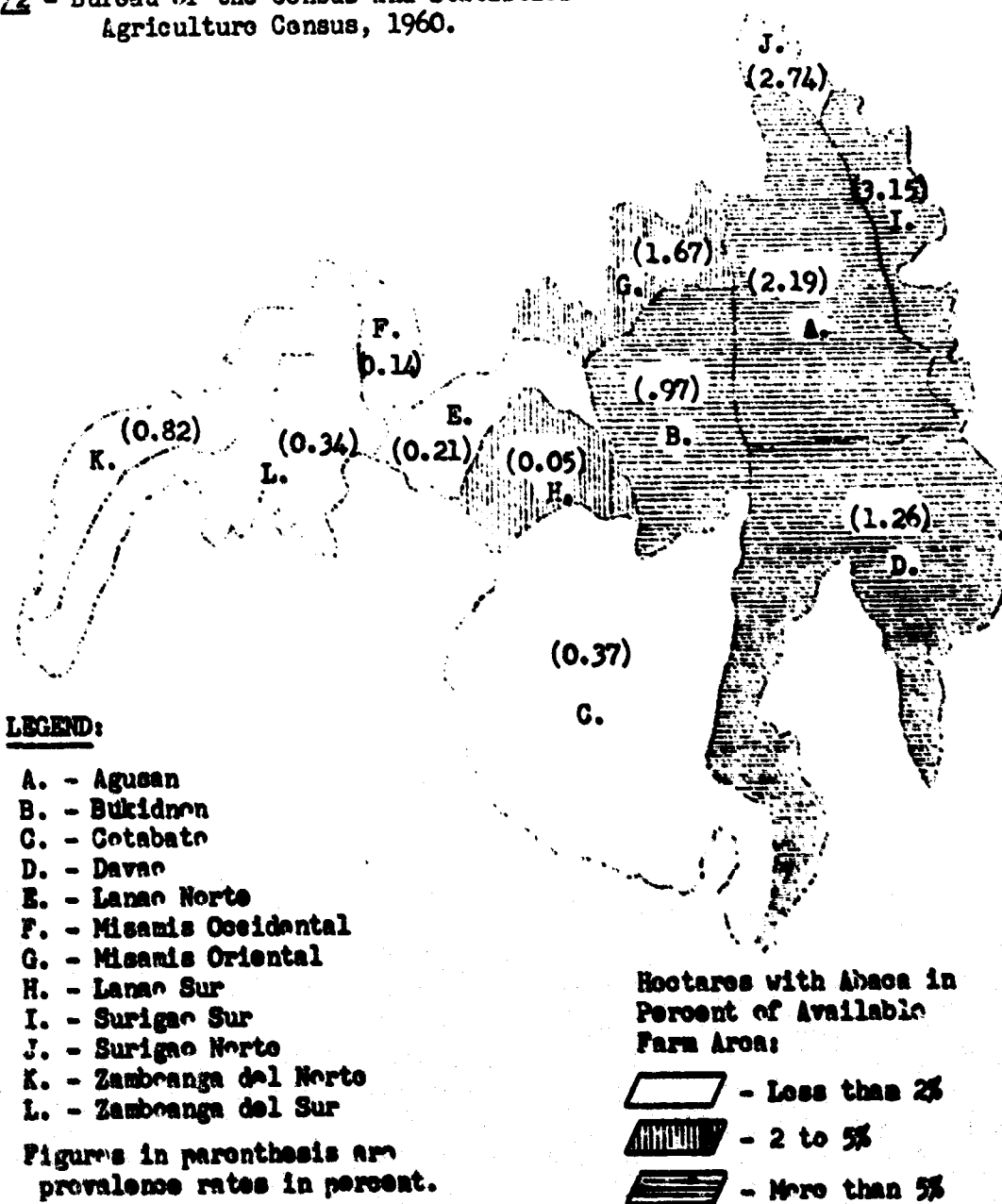


Table 1. FILARIA PREVALENCE RATES BY SEX AND  
PROVINCE, MINDANAO, 1968

Municipality and Barrio	No. Examined			Male		Female		Total	
	M	F	Total	No. Pos.	% Pos.	No. Pos.	% Pos.	No. Pos.	% Pos.
<b>I. AGUSAN -</b>									
1. Bunawan	264	265	529	12 (9)	4.5(3.4)	5 (6)	1.9(2.3)	17 (15)	3.2(2.8)
Libertad	116	113	229	9 (3)	7.8(2.6)	5 (2)	4.4(1.8)	14 (5)	6.1(2.2)
San Andres	55	44	99	1 (4)	1.8(7.3)	(1)	(2.3)	1 (5)	1.0(5.1)
Poblacion	93	108	201	2 (2)	2.2(2.2)	(3)	(2.8)	2 (5)	1.0(2.5)
2. Jabonga	52	46	98	-	0	-	0	-	0
Colorado	52	46	98	-	0	-	0	-	0
3. La Paz	283	331	614	5	1.8	3	0.9	8	1.3
Sagunto	283	331	614	5	1.8	3	0.9	8	1.3
4. Loreto	91	83	174	1 (2)	1.1(2.2)	(3)	(3.6)	1 (5)	0.6(2.9)
Waloe	51	49	100	1 (1)	2.0(2.0)	(1)	(2.0)	1 (2)	1.0(2.0)
Waloe	40	34	74	(1)	(2.5)	(2)	(5.9)	(3)	(4.1)
5. Prosperidad	163	180	343	4 (1)	2.4(0.6)	2	1.1	6 (1)	1.7(0.3)
Old Poblacion	106	106	212	3 (1)	2.8(0.9)	2	1.9	5 (1)	2.4(0.5)
Lucona	57	74	131	1	1.8	-	0	1	0.8
6. Talaogan	109	167	276	(1)	(0.9)	(3)	(1.8)	(4)	(1.4)
Poblacion	109	167	276	(1)	(0.9)	(3)	(1.8)	(4)	(1.4)
T O T A L	962	1072	2034	22(13)	2.3(1.4)	10(12)	0.9(1.1)	32(25)	1.6(1.2)
<b>II. BIKIDNON -</b>									
1. Valencia	27	23	50	-	0	-	0	-	0
Lake Guinoyoran	27	23	50	-	0	-	0	-	0
2. Don Carlos	126	143	269	1	0.8	-	0	1	0.4
Poblacion	61	72	133	1	1.6	-	0	1	0.8
Lakeside	65	71	136	-	0	-	0	-	0
T O T A L	153	166	319	1	0.6	-	0	1	0.3
<b>III. COTABATO NORTE -</b>									
1. Buluan	70	34	104	-	0	-	0	-	0
Buluan Lake	47	17	64	-	0	-	0	-	0
Poblacion	23	17	40	-	0	-	0	-	0
2. Ampatuan	10	3	13	-	0	-	0	-	0
Trinidad	10	3	13	-	0	-	0	-	0
TOTAL	80	37	117	-	0	-	0	-	0
<b>IV. COTABATO SUR -</b>									
1. Tudi	99	49	148	1	1.0	-	0	1	0.7
Basak	50	3	53	1	2.0	-	0	1	1.9
Palomaling	49	46	95	-	0	-	0	-	0
T O T A L	99	49	148	1	1.0	-	0	1	0.7

(Continued on next page - 26 )

Table 1. - Cont'd

Municipality and Barrio	No. Examined			Male		Female		Total	
	M	F	Total	No. Pos.	% Pos.	No. Pos.	% Pos.	No. Pos.	% Pos.
<b>V. DAVAO DEL NORTE --</b>									
1. Asuncion	178	150	328	4 (1)	2.2(0.6)	(2)	(1.3)	4 (3)	1.2(0.9)
Laac	53	42	95	3 (1)	5.7(1.9)	-	0	3 (1)	3.2(1.1)
Sagayan	125	108	233	1	0.8	(2)	(1.8)	1 (2)	0.4(0.8)
2. Compostela	53	55	108	-	0	1	1.8	1	0.9
Sta. Maria	25	23	48	-	0	1	4.3	1	2.1
Marapat	28	32	60	-	0	-	0	-	0
3. Kapalong	65	50	115	7	10.8	3	6.0	10	8.7
Calian	29	20	49	4	13.8	2	10.0	6	12.2
Mabantao	36	30	66	3	8.3	1	3.3	4	6.1
4. Monkayo	313	323	636	3	1.0	(1)	(0.3)	3 (1)	0.5(0.2)
Banlag	313	323	636	3	1.0	-	0	3	0.5
5. Montovista	32	16	48	-	0	-	0	-	0
Poblacion	32	16	48	-	0	-	0	-	0
6. New Bataan	43	41	84	-	0	-	0	-	0
Somsemin	43	41	84	-	0	-	0	-	0
<b>T O T A L</b>	<b>684</b>	<b>635</b>	<b>1319</b>	<b>14 (1)</b>	<b>2.0(0.1)</b>	<b>4 (3)</b>	<b>0.6(0.5)</b>	<b>18 (4)</b>	<b>1.4(0.3)</b>
<b>VI. DAVAO ORIENTAL -</b>									
1. Mati	22	16	38	1	4.5	1	6.2	2	5.3
Don S. Lopez	22	16	38	1	4.5	1	6.2	2	5.3
2. Taragona	33	16	49	3	9.1	-	0	3	6.1
Joviliar	33	16	49	3	9.1	-	0	3	6.1
3. Gov. Gonzales	99	36	135	5	5.1	1	2.8	6	4.4
Anitap	66	21	87	3	4.5	-	0	3	3.4
Upper Tibanban	33	15	48	2	6.1	1	6.7	3	6.2
<b>T O T A L</b>	<b>154</b>	<b>68</b>	<b>222</b>	<b>9</b>	<b>5.8</b>	<b>2</b>	<b>2.9</b>	<b>11</b>	<b>5.0</b>
<b>VII. LANA O DEL SUR -</b>									
1. Tapanan	177	46	223	-	0	-	0	-	0
Poblacion	77	3	80	-	0	-	0	-	0
Lalabuan	30	6	36	-	0	-	0	-	0
Tatayawan	58	24	82	-	0	-	0	-	0
Linak	12	13	25	-	0	-	0	-	0
<b>T O T A L</b>	<b>177</b>	<b>46</b>	<b>223</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>0</b>

(Continued on next page - 27 )



Table 1. - Cont'd

Municipality and Barrio	No. Examined			Male		Female		Total	
	M	F	Total	No. Pos.	% Pos.	No. Pos.	% Pos.	No. Pos.	% Pos.
VIII. SURIGAO DEL NORTE -									
1. Mainit	231	263	494	4	1.7	6	2.3	10	2.0
Mabini	95	113	208	-	0	2	1.8	2	1.0
Matinao	136	150	286	4	2.9	4	2.7	8	2.8
2. Tubod	93	66	159	5	5.4	1	1.5	6	3.8
Motorpool	51	27	78	2	3.9	-	0	2	2.6
Kawilan	42	39	81	3	7.1	1	2.6	4	4.9
TOTAL	324	329	653	9	2.8	7	2.1	16	2.4
IX. SURIGAO DEL SUR -									
1. Hinatuan	59	60	119	5	8.5	7	11.7	12	10.1
Roxas	23	25	48	3	13.0	4	16.0	7	14.6
Tagongon	36	35	71	2	5.6	3	8.6	5	7.0
2. Barobo	146	146	292	11	7.5	8	5.5	19	6.5
Javier	62	52	114	9	14.5	5	9.6	14	12.3
Campbagang	84	94	178	2	2.4	3	3.2	5	2.8
TOTAL	205	206	411	16	7.8	15	7.3	31	7.5
GRAND TOTAL	2838	2608	5446	72(14)	2.5(0.5)	38(15)	1.4(0.5)	110(29)	2.0(0.5)

**NOTE:**

Figures in parenthesis are B. galavi cases; 3 were mixed infections, all males in Libertad, Bunawan, Agusan; 1 mixed infection, male, Laao, Asuncion, Davao del Norte; all others are M. bancrofti cases.

Table 2. FILARIA PREVALENCE RATES BY AGE, SEX  
AND PROVINCE, MINDANAO, 1968

Age in Years	No. Examined			Male		Female		Total	
	M	F	Total	No. Pos.	% Pos.	No. Pos.	% Pos.	No. Pos.	% Pos.
<b>I. AGUSAN -</b>									
Less than 1	-	2	2	-	0	-	0	-	0
1 - 5	182	170	352	-	0	-	0	-	0
6 - 10	200	202	402	2(4)	1.0(2.0)	-	0	2(4)	0.5(1.0)
11 - 15	151	185	336	2(1)	1.3(0.7)	3(4)	1.6(2.2)	5(5)	1.5(1.5)
16 - 20	89	123	212	3(2)	3.4(2.2)	1(2)	0.8(1.6)	4(4)	1.9(1.9)
21 - 25	76	90	166	4(2)	5.3(2.6)	3	3.3	7(2)	4.2(1.2)
26 - 30	80	85	165	1(1)	1.2(1.2)	1(1)	1.2(1.2)	2(2)	1.2(1.2)
31 - 35	45	52	97	1(1)	2.2(2.2)	1(1)	1.9(1.9)	2(2)	2.1(2.1)
36 - 40	41	42	83	2	4.9	(2)	(4.8)	2(2)	2.4(2.4)
41 - 45	26	25	51	1(1)	3.8(3.8)	(2)	(8.0)	1(3)	2.0(5.9)
46 - 50	26	41	67	1	3.8	1	2.4	2	3.0
51 - 55	14	23	37	-	0	-	0	-	0
56 - 60	11	19	30	1	9.1	-	0	1	3.3
61 & over	21	13	34	4(1)	19.0(4.8)	-	0	4(1)	11.8(2.9)
All Ages	962	1072	2034	22(13)	2.3(1.4)	10(12)	0.9(1.1)	32(25)	1.6(1.2)

(NOTE: Figures in parenthesis are B. malayi cases, 3 mixed infections, all males.  
All others are W. bancrofti cases).

II. BUKIDNON - A single case of W. bancrofti, age group 21-25 years, male, was found from among 319 persons examined, all ages, both sexes.

III. COTABATO - For North Cotabato all the 117 persons examined were negative.  
For South Cotabato a case of W. bancrofti, male, age group 36-40 years, was found from among 148 persons examined, all ages, both sexes.

IV. DAVAO DEL NORTE -

Age in Years	No. Examined			Male		Female		Total	
	M	F	Total	No. Pos.	% Pos.	No. Pos.	% Pos.	No. Pos.	% Pos.
1 - 5	131	124	255	-	0	-	0	-	0
6 - 10	129	115	244	-	0	-	0	-	0
11 - 15	85	63	148	1	1.2	1(1)	1.6(1.6)	2(1)	1.4(0.7)
16 - 20	52	84	136	-	0	(1)	(1.2)	(1)	(0.7)
21 - 25	67	63	130	4(1)	6.0(1.5)	3	4.8	7(1)	5.4(0.8)
26 - 30	69	71	140	2	2.9	(1)	(1.4)	2	1.4(0.7)
31 - 35	51	37	88	2	3.9	-	0	2	2.3
36 - 40	43	38	81	1	2.3	-	0	1	1.2
41 - 45	20	13	33	1	5.0	-	0	1	3.0
46 - 50	13	10	23	-	0	-	0	-	0
51 - 55	6	4	10	1	16.7	-	0	1	10.0
56 - 60	8	7	15	-	0	-	0	-	0
61 & over	10	6	16	2	20.0	-	0	2	12.5
All Ages	684	635	1319	14(1)	2.0(0.1)	4(3)	0.6(0.5)	18(4)	1.4(0.3)

(NOTE: Figures in parenthesis are B. malayi cases, 1 mixed infection, male.  
All others are W. bancrofti cases).

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Table 2. - Cont'd

## V. DAVAO ORIENTAL

Age in Years	No. Examined			Male		Female		Total	
	M	F	Total	No. Pos.	% Pos.	No. Pos.	% Pos.	No. Pos.	% Pos.
1 - 5	16	13	29	-	0	-	0	-	0
6 - 10	11	12	23	-	0	-	0	-	0
11 - 15	23	13	36	-	0	-	0	-	0
16 - 20	26	10	36	1	3.8	2	20.0	3	8.3
21 - 25	20	2	22	2	10.0	-	0	2	9.1
26 - 30	14	5	19	3	21.4	-	0	3	15.3
31 - 35	17	4	21	1	5.9	-	0	1	4.8
36 - 40	12	3	15	1	8.3	-	0	1	6.7
41 - 45	6	2	8	-	0	-	0	-	0
46 - 50	4	2	6	1	25.0	-	0	1	16.7
51 - 55	2	-	2	-	0	-	none	-	0
56 - 60	1	2	3	-	0	-	0	-	0
61 & over	2	-	2	-	0	-	none	-	0
All Ages	154	68	222	9	5.8	2	2.9	11	5.0

VI. DAVAO DEL SUR - No survey done.

VII. LANA DEL NORTE - No survey done.

VIII. LANA DEL SUR - A total of 223 persons examined, all ages, both sexes, yielded negative results.

IX. MISAMIS OCCIDENTAL - No survey done.

X. MISAMIS ORIENTAL - No survey done.

## XI. SURIGAO DEL NORTE -

Age in Years	No. Examined			Male		Female		Total	
	M	F	Total	No. Pos.	% Pos.	No. Pos.	% Pos.	No. Pos.	% Pos.
1 - 5	55	48	103	-	0	-	0	-	0
6 - 10	78	64	142	1	1.3	-	0	1	0.7
11 - 15	55	70	125	-	0	-	0	-	0
16 - 20	26	18	44	1	3.8	1	5.6	2	4.5
21 - 25	15	17	32	-	0	-	0	-	0
26 - 30	14	22	36	3	21.4	1	4.5	4	11.1
31 - 35	17	23	40	1	5.9	-	0	1	2.5
36 - 40	18	20	38	-	0	1	5.0	1	2.6
41 - 45	14	17	31	2	14.3	2	11.8	4	12.9
46 - 50	15	8	23	-	0	1	12.5	1	4.3
51 - 55	9	5	14	1	11.1	-	0	1	7.1
56 - 60	5	11	16	-	0	1	9.1	1	6.3
61 & over	3	6	9	-	0	-	0	-	0
All Ages	324	329	653	9	2.8	7	2.1	16	2.5

(Continued on next page - 30 )

Table 2. - Cont'd

XII. SURIGAO DEL SUR -

Age in Years	No. Examined			Male		Female		Total	
	M	F	Total	No. Pres	% Pres.	No. Pres	% Pres.	No. Pres	% Pres.
1 - 5	30	31	51	-	0	-	0	-	0
6 - 10	35	43	78	-	0	2	4.7	2	2.6
11 - 15	41	41	82	2	4.9	1	2.4	3	3.7
16 - 20	21	14	35	2	9.5	-	0	2	5.7
21 - 25	15	17	32	-	0	3	17.6	3	9.4
26 - 30	13	10	23	4	30.8	1	10.0	5	21.7
31 - 35	7	6	13	-	0	-	0	-	0
36 - 40	10	15	25	1	10.0	3	20.0	4	16.0
41 - 45	13	10	23	3	23.1	2	20.0	5	21.7
46 - 50	9	8	17	1	11.1	1	12.5	2	11.8
51 - 55	10	4	14	1	10.0	1	25.0	2	14.3
56 - 60	8	5	13	2	25.0	1	20.0	3	23.1
61 & over	3	2	5	-	0	-	0	-	0
All Ages	205	206	411	16	7.8	15	7.3	31	7.5

XIII. ZAMBOANGA DEL NORTE - No survey done.

XIV. ZAMBOANGA DEL SUR - No survey done.

XV. ALL PROVINCES -

Age in Years	No. Examined			Male		Female		Total	
	M	F	Total	No. Pres	% Pres.	No. Pres	% Pres.	No. Pres	% Pres.
Less than 1	-	2	2	-	none	-	0	-	0
1 - 5	452	436	888	-	0	-	0	-	0
6 - 10	575	503	1078	3(4)	0.5(0.7)	2	0.4	5(4)	0.5(0.4)
11 - 15	452	417	869	5(1)	1.1(0.2)	5(5)	1.2(1.2)	10(6)	1.2(0.7)
16 - 20	274	287	561	7(2)	2.6(0.7)	4(3)	1.4(1.0)	11(5)	2.0(0.9)
21 - 25	238	209	447	11(3)	4.6(1.3)	9	4.3	20(3)	4.5(0.7)
26 - 30	231	220	451	13(1)	5.6(0.4)	3(2)	1.4(0.9)	16(3)	3.5(0.7)
31 - 35	171	135	306	5(1)	2.9(0.6)	1(1)	0.7(0.7)	6(2)	2.0(0.6)
36 - 40	147	135	282	6	4.1	4(2)	3.0(1.5)	10(2)	3.5(0.7)
41 - 45	94	73	167	7(1)	7.4(1.1)	4(2)	5.5(2.7)	11(3)	6.6(1.8)
46 - 50	77	75	152	3	3.9	3	4.0	6	3.9
51 - 55	50	38	88	3	6.0	1	2.6	4	4.5
56 - 60	37	46	83	3	8.1	2	4.3	5	6.0
61 & over	40	32	72	6(1)	15.0(2.5)	-	0	6(1)	8.3(3.1)
All Ages	2838	2608	5446	72(14)	2.5(0.5)	38(15)	1.4(0.5)	110(29)	2.0(0.5)

(NOTE: Figures in parenthesis are B. malayi cases. All others are W. bancrofti cases).

Table 3. PROPORTION POSITIVE FOR FILARIA AND THE RATIO (R) OF  
PREVALENCE RATES BETWEEN SEXES IN MUNICIPALITIES  
SURVEYED, MINDANAO, 1968

<u>Municipality</u>	<u>Percent Positive Both Sexes</u>	<u>Female PR*</u> <u>Male PR</u>
I. AGUSAN		
Bunawan	6.0	0.53
Jabonga	0	-
La Paz	1.3	0.50
Loreto	3.5	1.09
Prosperidad	2.0	0.37
Talacogon	1.4	2.00
II. BUKIDNON		
Don Carlos	0.4	0
Valencia	0	-
III. COTABATO NORTE		
Ampatuan	0	-
Buluan	0	-
IV. COTABATO SUR		
Tupi	0.7	0
V. DAVAO DEL NORTE		
Asuncion	2.1	0.46
Compostela	0.9	∞
Kapalong	8.7	0.56
Monkayo	0.6	0.50
Montevista	0	-
New Bataan	0	-
VI. DAVAO ORIENTAL		
Gov. Generoso	4.4	0.55
Mati	5.3	1.38
Taragona	6.1	0
VII. LANA DEL SUR		
Tamparan	0	-
VIII. SURIGAO DEL NORTE		
Mainit	2.0	1.35
Tubod	3.8	0.28
IX. SURIGAO DEL SUR		
Barobo	6.5	0.73
Hinatuan	10.1	1.38

\* Female PR - Female Prevalence Rate  
Male PR - Male Prevalence Rate

Table 4. FILARIA PREVALENCE RATES\* AND EXTENT OF ABACA PLANTATION IN PERCENT OF AVAILABLE FARM AREA, BY MUNICIPALITY, MINDANAO.

(\* FILARIA CONTROL SERVICES SURVEYS, 1961-1968)

Province and Municipality	Number Examined	Number Positive	Percent Positive	Available Farm Area In Hectares <sup>1</sup>	Hectares w/ Abaca in Percent of Available Farm Area <sup>1</sup>
1. AGUSAN (17) <sup>2</sup>	9,641	211	2.2	-----	5.31
Bayugan	656	9	1.4	new town/4	new town/4
Buonavista	2,303	18	0.8	4,353	0.3
Bunawan	699	51	7.3	9,868	12.1
Butuan City	1,422	8	0.6	22,764	0.1
Cabadbaran	1,310	15	1.1	7,424	1.6
Jabonga	1,016	16	1.6	6,635	1.9
Prosperidad	1,414	71	5.0	13,095	13.2
San Francisco	821	23	2.8	9,349	10.7
2. BUKIDNON (12) <sup>2</sup>	13,585	132	1.0	-----	6.36
Dangcagan	1,646	9	0.5	new town/4	new town/4
Imbatug	710	7	1.0	new town/4	new town/4
Impasugong	594	3	0.5	6,077	15.1
Kibawe	648	1	0.2	20,495	2.6
Libona	858	5	0.6	11,515	3.6
Malaybalay	1,338	3	0.2	29,631	8.8
Manolo Fortich	903	4	0.4	18,674	5.1
Maramag	1,437	2	0.1	35,308	0.8
Pangantocan	1,603	2	0.1	15,622	3.7
Sumilac	1,048	26	2.5	3,426	23.6
Talakag	1,091	28	2.6	12,315	17.2
Valencia	1,084	2	0.2	12,738	7.0
Malitbog	625	40	6.4	4,730	15.8
3. NORTH COTABATO (32) <sup>2</sup>	18,317	15	0.1	-----	0.87 <sup>2</sup>
Ampatuan	890	0	0.0	15,680	0.2
Buluan	710	0	0.0	52,933	0.02
Carmon	451	0	0.0	21,443	none
Columbia	726	0	0.0	new town/4	new town/4
Datu Piang	1,275	0	0.0	20,726	none
Dinaig	830	0	0.0	28,631	none
Isulan	1,034	0	0.0	19,044	none
Kabacan	685	4	0.6	21,699	0.2
Maganny	441	0	0.0	new town/4	new town/4
Magpet	1,563	2	0.1	new town/4	new town/4
Makilala	1,157	0	0.0	14,889	0.6
Matalam	730	3	0.4	new town/4	new town/4
M'lang	737	0	0.0	31,833	none
Norala	866	0	0.0	9,886	none
Nuling	1,009	0	0.0	21,050	0.1
Pagalongan	475	3	0.6	11,848	none
Parang	715	0	0.0	27,207	1.0
Pigoawayan	914	1	0.1	10,520	none
Pikit	1,285	0	0.0	24,972	none
Sultan sa Barangis	1,267	1	0.1	30,502	none
Upi	557	1	0.2	29,621	0.1

( Continued on next page - 33 )

Table 4. - Cont'd

Province and Municipality	Number Examined	Number Positive	Percent Positive	Available Farm Area In Hectares/1.	Hectares w/ Abaca in Percent of Available Farm Area/1.
4. SOUTH COTABATO	9,475	89	0.9		
Banga	1,910	1	0.1	23,589	1.7
General Santos	826	8	1.0	97,359	1.1
Glan	603	0	0.0	26,967	2.5
Kiamba	811	56	6.9	18,752	8.7
Koronadal	1,047	0	0.0	14,221	0.8
Maitum	468	8	1.7	9,315	0.8
Polomolek	561	4	0.7	17,102	1.6
Surala	1,024	2	0.2	new town/4	new town/4
Tacurong	630	0	0.0	14,083	0.03
Tamparan	356	0	0.0	new town/4	new town/4
Tantangan	706	1	0.1	new town/4	new town/4
Tupi	533	9	1.7	17,804	1.6
5. DAVAO DEL NORTE(31)/2	25,822	156	0.6		6.08/3
Asuncion	3,014	18	0.6	26,459	15.5
Kapalong	2,643	49	1.8	7,993	19.7
Mabini	994	26	2.6	12,324	2.0
Panabo	1,628	1	0.1	25,196	1.9
Sto. Tomas	441	1	0.2	11,416	7.9
Tagum	17,102	61	0.4	17,002	15.5
6. DAVAO ORIENTAL	2,799	55	2.0		
Lupon	1,609	16	1.0	11,073	0.1
Mati	1,190	39	3.3	24,767	4.1
7. DAVAO DEL SUR	6,021	226	3.8		
Digos	659	9	1.4	8,566	0.1
Malalag	1,401	26	1.8	21,309	0.2
Malita	2,432	112	4.6	23,836	0.4
Sta. Cruz	1,529	79	5.2	10,139	0.1
8. LANA O DEL NORTE(19)/2	3,382	7	0.2		0.11
Bacolod	303	1	0.3	4,619	none
Baroy	338	0	0.0	2,169	0.2
Iligan City	179	2	1.1	7,759	none
Kapatagan	428	0	0.0	12,886	0.01
Kauswagan	267	1	0.4	4,643	none
Kolambugan	664	2	0.3	2,045	none
Lala	256	0	0.0	8,430	0.1
Linamon	236	0	0.0	2,211	none
Tubod	711	1	0.1	4,918	0.4

( Continued on next page - 34 )

Table 4. - Cont'd

Province and Municipality	Number Examined	Number Positive	Percent Positive	Available Farm Area In Hectares/1	Hectares w/ Abaca in Percent of Available Farm Area/1
9. LANA DEL SUR (28) <sup>2</sup>	1,890	1	0.1		3.07
Balindong	272	0	0.0	3,035	none
Bayang	291	0	0.0	3,175	17.7
Bubong	237	0	0.0	3,800	none
Ganassi	214	0	0.0	3,783	0.4
Lumbatan	131	0	0.0	5,204	3.7
Madamba	145	0	0.0	818	none
Malabang	291	1	0.3	14,006	3.5
Molundo	112	0	0.0	1,369	none
Tamparan	197	0	0.0	1,973	none
10. MISAMIS OCCIDENTAL (15) <sup>2</sup>	4,364	6	0.1		0.61
Aloran	504	0	0.0	3,769	0.7
Bonifacio	574	0	0.0	6,676	3.4
Calamba	408	1	0.2	3,917	0.5
Clarín	504	0	0.0	3,799	0.2
Jimenez	459	0	0.0	4,140	0.8
Lopez Jaena	256	2	0.8	5,273	0.2
Sapang Dalaga	552	3	0.5	4,322	0.8
Tangub	887	0	0.0	7,486	0.3
Tudela	220	0	0.0	4,358	0.4
11. MISAMIS ORIENTAL (24) <sup>2</sup>	8,636	144	1.7		2.35
Alubijid	505	0	0.0	8,797	0.1
Balingasag	627	9	1.4	7,837	8.2
Balingoan	727	6	0.8	2,080	0.4
Claveria	335	4	1.2	9,998	15.1
El Salvador	667	1	0.1	3,596	none
Initao	622	11	1.8	6,039	0.2
Jasaan	767	28	3.6	4,532	2.9
Kinoguitan	717	9	1.2	4,876	0.2
Lagonglong	427	10	2.3	3,061	5.7
Lugait	274	0	0.0	now town/4	now town/4
Manticao	344	2	0.6	4,953	0.8
Naawan	541	13	2.4	2,503	0.5
Salay	928	35	3.8	4,907	4.2
Tagoloan	489	10	2.0	4,587	0.1
Talisay	666	6	0.9	6,029	0.05
12. SURIGAO DEL NORTE (21) <sup>2</sup>	12,374	339	2.7		0.32
Anaaon	1,907	38	2.0	2,566	none
Claver	1,704	81	4.8	2,636	none
Gigaquit	703	6	0.8	2,905	none
Mainit	1,461	31	2.1	6,187	1.5
Malimono	879	24	2.7	2,629	none
Placer	1,127	24	2.1	3,369	1.0
Sison	908	50	5.5	3,298	0.5
Surigao	1,453	45	3.1	7,264	none
Taganaan	633	23	3.6	2,463	none
Tubod	1,599	17	1.1	1,926	0.2

( Continued on next page - 35 )



Table 4.- Cont'd

Province and Municipality	Number Examined	Number Positive	Percent Positive	Available Farm Area In Hectares <sup>/1</sup>	Hectares w/ Abaca In Percent of Availa- ble Farm Area <sup>/1</sup>
13. SURIGAO DEL SUR (13) <sup>/2</sup>	7,235	228	3.2		9.48
Barobo	1,071	77	7.2	now town <sup>/4</sup>	now town <sup>/4</sup>
Cortes	1,276	49	3.8	3,960	6.1
Hinatuan	325	8	2.5	17,679	11.7
Liangá	866	36	4.2	8,902	6.2
Malixi	846	20	2.4	now town <sup>/4</sup>	now town <sup>/4</sup>
Tago	1,025	24	2.3	15,632	3.5
Tandag	1,826	14	0.8	4,118	none
14. ZAMBOANGA DEL NORTE (15) <sup>/2</sup>	4,728	39	0.8		1.44
Dapitan	385	3	0.8	12,927	0.2
Katipunan	454	1	0.2	14,312	0.3
La Libertad	347	2	0.6	3,624	6.0
Manukan	223	0	0.0	9,096	0.2
Mutia	615	7	1.1	now town <sup>/4</sup>	now town <sup>/4</sup>
New Piñan	667	13	1.9	16,108	7.0
Polanco	1,025	11	1.1	11,016	1.0
Rizal	244	0	0.0	5,888	0.3
Sindangan	768	2	0.3	13,753	0.1
15. ZAMBOANGA DEL SUR (23) <sup>/2</sup>	4,054	14	0.3		0.46
Aurora	240	0	0.0	7,121	1.0
Dumalinao	230	0	0.0	14,666	0.04
Dumagag	643	0	0.0	22,378	0.3
Ipil	117	0	0.0	14,724	0.02
Kabasalan	356	3	0.8	5,129	0.3
Kumalarang	207	1	0.5	4,464	none
Mahayag	609	2	0.3	now town <sup>/4</sup>	now town <sup>/4</sup>
Melavo	441	0	0.0	17,486	0.4
Olutanga	735	4	0.5	8,733	0.2
Siay	438	1	0.2	10,123	0.2
Titay	38	3	7.9	now town <sup>/4</sup>	now town <sup>/4</sup>

<sup>/1</sup> - Data obtained from the 1960 Agricultural Census, Bureau of the Census and Statistics.

<sup>/2</sup> - Figures in parenthesis are the total number of municipalities for each province as of the 1960 census.

<sup>/3</sup> - For the three Davaos.

<sup>/4</sup> - No figures available in 1960 Agricultural Census.

<sup>/5</sup> - For the two Cotabatos.

Table 5. FILARIA PREVALENCE RATES AND EXTENT OF ABACA PLANTATION  
IN PERCENT OF AVAILABLE FARM AREA BY PROVINCE, MINDANAO.

Province	Filaria Prevalence Rates (%)		Available Farm Area In Hect <sup>2</sup>	Hectares with Abaca in Per- cent of Avail- able Farm A Area/2
	Institute of Hy- giene Survey	Filaria Control Ser- vices Survey/1		
Agusan	2.65(6)	2.19(8)	120,090	5.31
Bukidnon	0.31(2)	0.97(13)	175,625	6.36
Cotabato/3	0.38(3)	0.37(33)	704,907	0.87
Davao/4	2.14(9)	1.26(12)	460,385	6.08
Lanao del Norte	0 (1)	0.21(9)	89,402	0.11
Lanao del Sur	-----	0.05(9)	130,007	3.07
Misamis Occidental	-----	0.14(9)	72,468	0.61
Misamis Oriental	-----	1.67(15)	140,805	2.35
Surigao del Norte	2.45(2)	2.74(10)	73,754	0.32
Surigao del Sur	7.54(2)	3.15(7)	89,785	9.48
Zamboanga del Norte	-----	0.82(9)	135,068	1.44
Zamboanga del Sur	-----	0.34(11)	312,663	0.46

NOTE: Figures in parenthesis after prevalence figures are the number of municipalities covered by each survey.

/1 - Filaria Control Service, Department of Health Surveys, 1961-1968.

/2 - Bureau of the Census and Statistics Agriculture Census, 1960.

/3 - For the combined provinces of Cotabato.

/4 - For the combined provinces of Davao.

Table 6. AVERAGE MICROFILARIAL DENSITY (20 mm<sup>3</sup>) BY AGE, SEX  
AND PROVINCE, MINDANAO, 1968.

I. AGUSAN -	Total			Average Mf. Count per 20 mm <sup>3</sup> blood per positive		
	M	F	Total	M	F	Total
Age in Years						
1 - 5	-	-	-	-	-	-
6 - 10	3(6)	-	3(6)	1.5(1.5)	-	1.5(1.5)
11 - 15	20(3)	4(19)	24(16)	10.0(3.0)	1.3(3.2)	4.8(3.2)
16 - 20	153(10)	1(3)	154(13)	51.0(5.0)	1.0(1.5)	38.5(3.2)
21 - 25	33(5)	12	45(5)	8.2(2.5)	4.0	6.4(2.5)
26 - 30	18(2)	1(1)	19(3)	18.0(2.0)	1.0(1.0)	19.5(1.5)
31 - 35	2(2)	4(1)	6(3)	2.0(2.0)	4.0(1.0)	3.0(1.5)
36 - 40	13	(5)	13(5)	6.5	(2.5)	6.5(2.5)
41 - 45	6(31)	(4)	6(35)	6.0(31.0)	(2.0)	6.0(11.7)
46 - 50	1	1	2	1.0	1.0	1.0
51 - 55	-	-	-	-	-	-
56 - 60	8	-	8	8.0	-	8.0
61 & over	12(9)	-	12(9)	3.0(9.0)	-	3.0(9.0)
All Ages	269(68)	23(27)	292(95)	12.2(5.2)	2.3(2.2)	9.1(3.8)
II. DAVAO DEL NORTE -						
1 - 5	-	-	-	-	-	-
6 - 10	-	-	-	-	-	-
11 - 15	2	17(1)	19(1)	2.0	17.0(1.0)	9.5(1.0)
16 - 20	-	(2)	(2)	-	(2.0)	(2.0)
21 - 25	179(15)	12	191(15)	44.8(15.0)	4.0	27.3(15.0)
26 - 30	11	(3)	11(3)	5.5	(3.0)	5.5(3.0)
31 - 35	5	-	5	2.5	-	2.5
36 - 40	1	-	1	1.0	-	1.0
41 - 45	3	-	3	3.0	-	3.0
46 - 50	-	-	-	-	-	-
51 - 55	8	-	8	8.0	-	8.0
56 - 60	-	-	-	-	-	-
61 & over	22	-	22	11.0	-	11.0
All Ages	231(15)	29(6)	260(21)	16.5(15.0)	7.2(2.0)	14.4(5.2)

(NOTE: Figures in parenthesis are total counts for B. malayi cases. All others are W. bancrofti cases.)

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Table 6. - Cont'd

III. DAVAO ORIENTAL -

Age in Years	Total		Mf.		Count		Average Mf. Count per 20 mm <sup>3</sup> blood per positive			
	M	.	F	.	Total	.	M	.	F	Total
1 - 5	-		-		-		-		-	-
6 - 10	-		-		-		-		-	-
11 - 15	-		-		-		-		-	-
16 - 20	3		19		22		3.0		9.5	7.3
21 - 25	74		-		74		37.0		-	37.0
26 - 30	22		-		22		7.3		-	7.3
31 - 35	2		-		2		2.0		-	2.0
36 - 40	36		-		36		36.0		-	36.0
41 - 45	-		-		-		-		-	-
46 - 50	5		-		5		5.0		-	5.0
51 - 55	-		-		-		-		-	-
56 - 60	-		-		-		-		-	-
61 & over	-		-		-		-		-	-
All Ages	142		19		161		15.8		9.5	14.6

IV. SURIGAO DEL NORTE -

1 - 5	-		-		-		-		-	-
6 - 10	15		-		15		15.0		-	15.0
11 - 15	-		-		-		-		-	-
16 - 20	35		2		37		35.0		2.0	18.5
21 - 25	-		-		-		-		-	-
26 - 30	125		46		171		41.7		46.0	42.8
31 - 35	6		-		6		6.0		-	6.0
36 - 40	-		-		-		-		-	-
41 - 45	83		24		107		41.5		12.0	26.8
46 - 50	-		2		2		-		2.0	2.0
51 - 55	32		-		32		32.0		-	32.0
56 - 60	-		10		10		-		10.0	10.0
61 & over	-		-		-		-		-	-
All Ages	296		84		380		32.9		12.0	23.8

V. SURIGAO DEL SUR -

1 - 5	-		-		-		-		-	-
6 - 10	-		4		4		-		2.0	2.0
11 - 15	20		5		25		10.0		5.0	8.3
16 - 20	200		-		200		100.0		-	100.0
21 - 25	-		6		6		-		2.0	2.0
26 - 30	62		2		64		15.5		2.0	12.8
31 - 35	-		-		-		-		-	-
36 - 40	38		27		65		38.0		9.0	16.2
41 - 45	38		23		61		12.7		11.5	12.2
46 - 50	83		24		107		83.0		24.0	53.5
51 - 55	10		62		72		10.0		62.0	36.0
56 - 60	28		8		36		14.0		8.0	12.0
61 & over	-		-		-		-		-	-
All Ages	479		161		640		30.0		10.7	20.6

Table 7. DISTRIBUTION OF CASES BY INTENSITY OF  
MICROFILAREMIA, MINDANAO, 1968

Mf. Count Per 20 mm <sup>3</sup>	I. AGUSAN			II. DAVAO DEL NORTE		
	M	F	Total	M	F	Total
1 - 5	11(10)	9(11)	20(21)	8	2(2)	10(2)
6 - 10	3(2)	1(1)	4(3)	3	1	4
11 - 25	7	-	7	1(1)	1	2(1)
26 - 50	(1)	-	(1)	1	-	1
51 - 100	-	-	-	-	-	-
101 - 200	1	-	1	1	-	1
<b>TOTAL</b>	<b>22(13)</b>	<b>10(12)</b>	<b>32(25)</b>	<b>14(1)</b>	<b>4(2)</b>	<b>18(3)</b>
Highest Mf. Count	123(31)	7(3)	-	134(15)	17(3)	-
Md Mf. Count	5.5(2.0)	1.5(2.0)	2.5(2.0)	4.5(15)*	5.0(2.0)	4.5(2.0)
Mf. Count Per 20 mm <sup>3</sup>	III. DAVAO ORIENTAL			IV. SURIGAO DEL NORTE		
	M	F	Total	M	F	Total
1 - 5	5	1	6	-	4	4
6 - 10	2	-	2	1	1	2
11 - 25	-	1	1	2	1	3
26 - 50	1	-	1	4	1	5
51 - 100	1	-	1	2	-	2
101 - 200	-	-	-	-	-	-
<b>TOTAL</b>	<b>9</b>	<b>2</b>	<b>11</b>	<b>9</b>	<b>7</b>	<b>16</b>
Mf. Count Per 20 mm <sup>3</sup>	V. SURIGAO DEL SUR			VI. ALL PROVINCES		
	M	F	Total	M	F	Total
1 - 5	5	9	14	29(10)	25(14)	54(24)
6 - 10	2	2	4	12(2)	5(1)	17(3)
11 - 25	4	3	7	15(1)	6	21(1)
26 - 50	2	-	2	8(1)	1	9(1)
51 - 100	2	1	3	5	1	6
101 - 200	1	-	1	3	-	3
<b>TOTAL</b>	<b>16</b>	<b>15</b>	<b>31</b>	<b>72(14)</b>	<b>38(15)</b>	<b>110(29)</b>
Highest Mf. Count	SURIGAO DEL NORTE			SURIGAO DEL SUR		
	86	45	-	135	62	-
	DAVAO ORIENTAL			ALL PROVINCES		
	71	15	-	135(31)	62(3)	-
Md Mf. Count	SURIGAO DEL NORTE			SURIGAO DEL SUR		
	27.0	10.0	17.0	14.0	3.0	8.0
	DAVAO ORIENTAL			ALL PROVINCES		
	5.0	9.5	5.0	8.9(4.5)	4.8(3.7)	6.3(4.0)

(NOTE: Figures in parenthesis are *B. malayi* cases. All others are *M. bancrofti* cases. One case each of *M. bancrofti*, both males, for Bukidnon and South Cotabato were included in All Provinces.)

\* A single case of *B. malayi* only.

Table 8. MICROFILARIAL DENSITY OF CASES PER 20 MM<sup>3</sup> BLOOD, BY SEX,  
MINDANAO, 1968.

I. AGUSAN

(a) W. bancrofti Cases -

Mf. Count per 20 mm <sup>3</sup>	M A L E			F E M A L E			BOTH SEXES		
	No.	Cum.!! Freq!!	Cum.!! %	No.	Cum.!! Freq!!	Cum.!! %	No.	Cum.!! Freq!!	Cum.!! %
1	6	6	27.27	5	5	50.00	11	11	34.38
2	2	8	36.36	2	7	70.00	4	15	46.88
3	1	9	40.91	1	8	80.00	2	17	53.12
4	1	10	45.45	1	9	90.00	2	19	59.38
5	1	11	50.00	-	9	90.00	1	20	62.50
6	1	12	54.54	-	9	90.00	1	21	65.62
7	1	13	59.09	1	10	100.00	2	23	76.88
8	1	14	63.64	-	-	-	1	24	75.00
9	-	14	63.64	-	-	-	-	24	75.00
10	-	14	63.64	-	-	-	-	24	75.00
11 - 20	7	21	95.45	-	-	-	7	31	96.88
21 - 30	-	21	95.45	-	-	-	-	31	96.88
31 - 40	-	21	95.45	-	-	-	-	31	96.88
41 - 50	-	21	95.45	-	-	-	-	31	96.88
51 - 60	-	21	95.45	-	-	-	-	31	96.88
61 - 70	-	21	95.45	-	-	-	-	31	96.88
71 - 80	-	21	95.45	-	-	-	-	31	96.88
81 - 90	-	21	95.45	-	-	-	-	31	96.88
91 - 100	-	21	95.45	-	-	-	-	31	96.88
101 - 200	1	22	100.00	-	-	-	1	32	100.00
T O T A L	22			10			32		

(b) B. malayi Cases -

1	3	3	23.08	5	5	41.67	8	8	32.00
2	4	7	53.85	3	8	66.67	7	15	60.00
3	2	9	69.23	3	11	91.67	5	20	80.00
4	1	10	76.92	-	11	91.67	1	21	84.00
5	-	10	76.92	-	11	91.67	-	21	84.00
6	-	10	76.92	-	11	91.67	-	21	84.00
7	1	11	84.62	1	12	100.00	2	23	92.00
8	-	11	84.62	-	-	-	-	23	92.00
9	1	12	92.31	-	-	-	1	24	96.00
10	-	12	92.31	-	-	-	-	24	96.00
11 - 20	-	12	92.31	-	-	-	-	24	96.00
21 - 30	-	12	92.31	-	-	-	-	24	96.00
31 - 40	1	13	100.00	-	-	-	1	25	100.00
T O T A L	13			12			25		

(Continued on next page - 41 )

Table 8. - Cont'd

II. DAVAO DEL NORTE \*W. bancrofti Cases

Mf. Count per 20 mm <sup>3</sup>	M A L E			F E M A L E			BOTH SEXES		
	No.	Cum. Freq.	Cum. %	No.	Cum. Freq.	Cum. %	No.	Cum. Freq.	Cum. %
1	3	3	20.00	1	1	14.28	4	4	19.05
2	1	4	26.67	2	3	42.86	3	7	33.33
3	1	5	33.33	2	5	71.43	2	9	42.86
4	2	7	46.67	-	5	71.43	2	11	52.38
5	1	8	53.33	-	5	71.43	1	12	57.14
6	1	9	60.00	-	5	71.43	1	13	61.90
7	1	10	66.67	1	6	85.71	2	15	71.43
8	1	11	73.33	-	6	85.71	1	16	76.19
9	-	11	73.33	-	6	85.71	-	16	76.19
10	-	11	73.33	-	6	85.71	-	16	76.19
11 - 20	2	13	86.67	1	7	100.00	3	19	90.48
21 - 30	-	13	86.67	-	-	-	-	19	90.48
31 - 40	1	14	93.33	-	-	-	1	20	95.24
41 - 50	-	14	93.33	-	-	-	-	20	95.24
51 - 60	-	14	93.33	-	-	-	-	20	95.24
61 - 70	-	14	93.33	-	-	-	-	20	95.24
71 - 80	-	14	93.33	-	-	-	-	20	95.24
81 - 90	-	14	93.33	-	-	-	-	20	95.24
91 - 100	-	14	93.33	-	-	-	-	20	95.24
101 - 200	1	15	100.00	-	-	-	1	21	100.00
T O T A L	15			6			21		

NOTE: \* Included in the above distribution are the 4 B. malayi cases.III. DAVAO ORIENTALW. bancrofti Cases -

Mf. Count per 20 mm <sup>3</sup>	BOTH SEXES		
	No.	Cum. Freq.	Cum. %
1	-	-	-
2	1	1	9.09
3	2	3	27.27
4	2	5	45.45
5	1	6	54.54
6	-	6	54.54
7	-	6	54.54
8	-	6	54.54
9	2	8	72.73
10	-	8	72.73
11 - 20	1	9	81.82
21 - 30	-	9	81.82
31 - 40	1	10	90.91
41 - 50	-	10	90.91
51 - 60	-	10	90.91
61 - 70	-	10	90.91
71 - 80	1	11	100.00
81 - 200	-	-	-
T O T A L	11		

(Continued on next page - 42 )

Table 8. - Cont'd

IV. SURIGAO DEL NORTE

W. bancrofti Cases -											
Mf. Count per 20 mm <sup>3</sup>	M A L E			F E M A L E			B O T H S E X E S				
	No.	Cum.	Cum.	No.	Cum.	Cum.	No.	Cum.	Cum.		
		!!Freq!!	%		!!Freq!!	%		!!Freq!!	%		
1	-	-	-	1	1	14.28	1	1	6.25		
2	-	-	-	2	3	42.86	2	3	18.75		
3	-	-	-	-	3	42.86	-	3	18.75		
4	-	-	-	-	3	42.86	-	3	18.75		
5	-	-	-	1	4	57.14	1	4	25.00		
6	1	1	11.11	-	4	57.14	1	5	31.25		
7	-	1	11.11	-	4	57.14	-	5	31.25		
8	-	1	11.11	-	4	57.14	-	5	31.25		
9	-	1	11.11	-	4	57.14	-	5	31.25		
10	-	1	11.11	1	5	71.43	1	6	37.50		
11 - 20	2	3	33.33	1	6	85.71	3	9	56.25		
21 - 30	2	5	55.56	-	6	85.71	2	11	68.75		
31 - 40	2	7	77.78	-	6	85.71	2	13	81.25		
41 - 50	-	7	77.78	1	7	100.00	1	14	87.50		
51 - 60	1	8	88.89	-	-	-	1	15	93.75		
61 - 70	-	8	88.89	-	-	-	-	15	93.75		
71 - 80	-	8	88.89	-	-	-	-	15	93.75		
81 - 90	1	9	100.00	-	-	-	1	16	100.00		
T O T A L	9			7			16				

V. SURIGAO DEL SUR

W. bancrofti Cases -											
1	-	-	-	3	3	20.00	3	3	9.68		
2	-	-	-	3	6	40.00	3	6	19.35		
3	3	3	18.75	2	8	53.33	5	11	35.48		
4	-	3	18.75	-	8	53.33	-	11	35.48		
5	2	5	31.25	1	9	60.00	3	14	45.15		
6	-	5	31.25	1	10	66.67	1	15	48.39		
7	-	5	31.25	-	10	66.67	-	15	48.39		
8	-	5	31.25	1	11	73.33	1	16	51.61		
9	-	5	31.25	-	11	73.33	-	16	51.61		
10	2	7	43.75	-	11	73.33	2	18	58.06		
11 - 20	2	9	56.25	1	12	80.00	3	21	67.74		
21 - 30	2	11	68.75	2	14	93.33	4	25	80.64		
31 - 40	1	12	75.00	-	14	93.33	1	26	83.87		
41 - 50	1	13	81.25	-	14	93.33	1	27	87.10		
51 - 60	-	13	81.25	-	14	93.33	-	27	87.10		
61 - 70	1	14	87.50	1	15	100.00	2	29	93.55		
71 - 80	-	14	87.50	-			-	29	93.55		
81 - 90	1	15	93.75	-			1	30	96.77		
91 - 100	-	15	93.75	-			-	30	96.77		
101 - 200	1	16	100.00	-			1	31	100.00		
<hr/>				<hr/>				<hr/>			
T O T A L				16	15		31				

( Continued on next page - 43 )



Table 8. - Cont'd

VI. OVERALL

a. <u>W. bancrofti</u> Cases *				b. <u>B. malayi</u> Cases			
Mf. Count per 20 mm <sup>3</sup>	BOTH SEXES			BOTH SEXES			
	No.	Freq.	Cum. %	No.	Freq.	Cum. %	
1	18	18	16.36	9	9	31.03	
2	12	30	27.27	8	17	58.62	
3	11	41	37.27	6	23	79.31	
4	6	47	42.73	1	24	82.76	
5	7	54	49.09	-	24	82.76	
6	4	58	52.73	-	24	82.76	
7	4	62	56.36	2	26	89.66	
8	3	65	59.09	-	26	89.66	
9	3	68	61.82	1	27	93.10	
10	3	71	64.54	-	27	93.10	
11 - 20	17	88	80.00	1	28	96.55	
21 - 30	6	94	85.45	-	28	96.55	
31 - 40	5	99	90.00	1	29	100.00	
41 - 50	2	101	91.82	-			
51 - 60	1	102	92.73	-			
61 - 70	2	104	94.54	-			
71 - 80	1	105	95.45	-			
81 - 90	2	107	97.27	-			
91 - 100	-	107	97.27	-			
101 - 200	3	110	100.00	-			
T O T A L	110			29			

\* Included in the distribution are 2 W. bancrofti cases from Bukidnon and South Cotabato.

Table 9. MICROFILAREMIA RATES AND SOME VALUES OBTAINED  
FROM THE FREQUENCY DISTRIBUTION OF  
MICROFILARIAL DENSITY, BY PROVINCE  
MINDANAO, 1968

Province	Sex	Micro- filaremia Rates (%)		Median Microfi- larial Count (MfD <sub>50</sub> )		Percent of Cases with Mf-1*		a		b	
		W.b.	B.m.	W.b.	W.b.	W.b.	B.m.	W.b.	B.m.	W.b.	B.m.
Agusan	M	2.3	1.4	3.73	1.76	21	35	4.20	4.61	1.40	1.58
	F	0.9	1.1	0.98	1.12	51	46	5.01	4.89	1.79	2.23
	Both	1.6	1.2	2.25	1.25	32	44	4.53	4.84	1.33	1.68
Davao del Norte**	M	2.0	0.1	3.98	-	22	-	4.22	-	1.30	-
	F	0.6	0.5	2.51	-	20	-	4.17	-	2.07	-
	Both	1.4	0.3	3.27	-	24	-	4.31	-	1.34	-
Davao Oriental	Both	5.0	-	5.95	-	11	-	3.79	-	1.56	-
Surigao del Norte	M	2.8	-	22.31	-	<.1	-	1.47	-	2.62	-
	F	2.1	-	4.46	-	19	-	4.12	-	1.36	-
	Both	2.4	-	11.03	-	4	-	3.19	-	1.74	-
Surigao del Sur	M	7.8	-	12.96	-	3	-	3.18	-	1.63	-
	F	7.3	-	3.22	-	24	-	4.30	-	1.37	-
	Both	7.5	-	7.02	-	10	-	3.72	-	1.51	-
Over-all	Both	2.0	0.5	5.13	1.37	15	41	3.94	4.77	1.48	1.66

\* Percent of cases with microfilariae count 1.

\*\* Included in W.b. are the 4 B.m. cases.

W.b.-W. bancrofti

B.m.-B. malayi

a & b are constants in the regression equation.

Table 10. AVERAGE MICROFILARIAL DENSITIES FOR B. MALAYI  
BY AGE, PALAWAN, SULU AND AGUSAN,  
1965, 1967 AND 1968.

Age in Years	<u>PALAWAN</u> <sup>/1</sup>		<u>SULU</u> <sup>/2</sup>		<u>AGUSAN</u>	
	Number Positive	Ave. Mf. Count/Pos.	Number Positive	Ave. Mf. Count/Pos.	Number Positive	Ave. Mf. Count/Pos.
Less than 1	-	0.0	-	0.0	-	0.0
1 - 5	24	13.3	1	4.0	-	0.0
6 - 10	37	17.1	5	6.2	4	1.5
11 - 15	17	33.1	3	5.6	5	3.2
16 - 20	18	41.7	2	14.0	4	3.2
21 - 25	18	6.1	2	14.5	2	2.5
26 - 30	22	43.3	4	2.0	2	1.5
31 - 35	13	39.5	4	4.0	2	1.5
36 - 40	14	39.5	5	1.6	2	2.5
41 - 45	9	21.0	-	0.0	3	11.7
46 - 50	4	15.8	-	0.0	-	-
51 - 55	4	57.5	-	0.0	-	-
56 - 60	1	4.0	1	8.0	-	-
61 & over	3	2.3	2	1.5	1	9.0
T O T A L	184	26.6	29	5.2	25	3.8

Prevalence  
Rate (%)  $\frac{184}{3726} \times 100 = 4.9$

$\frac{29}{3695} \times 100 = 0.78$

$\frac{25}{2034} \times 100 = 1.2$

Range of Mf.  
Counts/20 mm<sup>3</sup> 1-800

1-29

1-31

Median Mf.  
Counts/20 mm<sup>3</sup> 6

3

2

/1 - Cabrera et al.: Bancroftian and malayan filariasis in Palawan: Extent and distribution. Acta Med. Phil. 3(ser. 2):20, 1966.

/2 - Cabrera et al.: The second endemic focus for malayan filariasis in the Republic of the Philippines. Acta Med. Phil. 5 (ser. 2): 1, 1968.

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13. ABSTRACT The purpose of this investigation is to determine the endemic areas for malayan filariasis in the island of Mindanao by means of spot or selective surveys. Night blood smears were taken from individuals whose dwellings are located close to fresh water swamps which are ideal breeding places for the vector mosquitoes. Giemsa-stained blood smears were sent by air for examination at the Institute of Hygiene. The most relevant finding in this study is the finding of an endemic focus for <u>Brugia malayi</u> (malayan filariasis) in four municipalities of the province of Agusan. Out of 2,034 persons examined, a total of 25 <u>B. malayi</u> cases (1.2 percent) were found from Agusan. This finding coupled with the presence in the area of fresh water swamps we may safely state that we have found the third endemic focus for malayan filariasis in the Republic of the Philippines. Although we found 4 scattered <u>B. malayi</u> cases from North Davao we are not convinced that the area is endemic for malayan filariasis. It is very possible that infection could have been contracted from Agusan being just adjacent to North Davao. Future investigators should always try to differentiate filariasis caused by <u>W. bancrofti</u> from that caused by <u>B. malayi</u> particularly in Agusan and North Davao. Epidemiological observations in past surveys on <u>W. bancrofti</u> were confirmed, such as: correlation of abaca industry and endemicity of bancroftian filariasis; higher prevalence among males than females; higher in older than in younger age groups. (Author)		

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